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CONTENTS.

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No. 1. *January.*

	PAGE
The Present Problems of Geography. By Hugh Robert Mill, D.SC., LL.D. ..	1
Geography and Education	17
The Mountains of Turkestan. By Ellsworth Huntington (with 6 Illustrations and Sketch-map)	22
The Physical History of the Victoria Falls. By A. J. C. Molyneux, F.G.S., F.R.G.S. (with 9 Plates and Plan)	40
The Eighth International Geographical Congress. By Hugh Robert Mill, D.SC., LL.D.	55
Mr. R. L. Reid's Journeys in Portuguese East Africa (with Map)	64
Hydrography of the Andes. By Dr. J. W. Evans (with 2 Sketch-maps) ..	66
Hydrography of the Nile. By A. S. W.	75
The French Conquest of the Canaries in 1402–6, and the Authority for the same. By C. Raymond Beazley, M.A.	77
Reviews :—	
EUROPE—Russian Lapland. Germany in the Middle Ages. Survey Atlas of England and Wales	81
ASIA—Tibet. Asiatic Turkey. Siberia. Eastern Siberia. Manchuria ..	84
AFRICA—Morocco	87
AMERICA—United States	88
The Monthly Record	89
Obituary	100
Meetings of the Royal Geographical Society	101
Geographical Literature of the Month	102
New Maps	115

MAPS.

Sketch-map showing Ellsworth Huntington's Routes in Central Asia	25
Plan of Victoria Falls	43
Sketch-maps of the River System of the Andes	67, 69
Sketch-map of Parts of the Gorongoza and Sheringoma Territories	120

No. 2. *February.*

On a New Genus of Algæ, *Clementsia Markhamiana*. By George Murray, F.R.S. (with Plate)	121
On Certain Recent Changes in the Crater of Stromboli. By Tempest Anderson, M.D., D.SC. (with Sketch-map and 11 Plates)	123
The Mountains of Turkestan. By Ellsworth Huntington (with 7 Illustrations)	139
South-Western Abyssinia. By B. H. Jessen (with 5 Illustrations and Map)	158
Notes on an Irish Lake District. By O. J. R. Howarth (with Sketch-map)	172
Lieut. Boyd Alexander's Expedition through Nigeria	176
Jomokangkar. By Major C. F. Close, C.M.G., R.E.	178
The Submarine Great Cañon of the Hudson River. By J. W. Spencer, A.M., PH.D., F.G.S. (with Sketch-map and 6 Sections)	180

PAGE

On the Method of Studying Thalassology. By Prof. Ludovico Marini .. 191
The Indian Census Report 197
Reviews:—
EUROPE—History of Alpine Climbing. Italy. Climate of Vienna and Lower Austria 199
ASIA—Ethnological Investigations in Netherlands Borneo 202
AFRICA—The Sahara. A West African Vade-Mecum 203
AMERICA—The Argentine and Chile 205
GENERAL—History of Cartography. Geographical Terms 206
The Monthly Record 208
Obituary 221
Correspondence 226
Meetings of the Royal Geographical Society 226
Geographical Literature of the Month 227
New Maps 237

MAPS.

Sketch-map of Stromboli .. .. *facing* 124
Sketch-map of Lough Glencullin and Dhulough 175
Sketch-map of the Submarine Great Cañon of the Hudson River 181
Sketch-map showing the Routes of Mr. W. N. McMillan's Expedition, 1904 244

No. 3. *March.*

From Srinagar to the Sources of the Chogo Lungma Glacier. By William Hunter Workman, M.A., M.D., F.R.G.S., Member Alpine Club (with 6 Plates and Map) 245
Bathymetrical Survey of the Fresh-water Lochs of Scotland. Under the Direction of Sir John Murray, K.C.B., F.R.S., D.SC., etc., and Laurence Pullar, F.R.S.E. (with 3 Illustrations, Index-map, and 5 Plates) 268
A Journey to Lake San Martin, Patagonia. By Captain H. L. Crosthwait, R.E. (with 8 Plates and Diagram) 286
Mr. C. W. Hobley's Recent Journey in East Africa (with Sketch-map) .. 292
The Expedition to Western Tibet 295
Captain Owen's Map of Unyoro (with Sketch-map) 296
Notes on the Upper Liao, Manchuria. By Robert T. Turley (with Sketch-map) 297
The Major Natural Regions: An Essay in Systematic Geography. By A. J. Herbertson, M.A., PH.D. (with 4 Maps) 300
Reviews:—
EUROPE—Sweden. European Cartography 312
ASIA—The Trans-Siberian Railway. The Dutch in Java. Palestine .. 315
AMERICA—The Andes 317
AUSTRALASIA AND PACIFIC ISLANDS—Melanesia 318
PHYSICAL GEOGRAPHY—The New Seismology: Two New Text-books .. 320
COMMERCIAL GEOGRAPHY—Herbertson's Commercial Geography 322
GENERAL—The British Empire 323
The Monthly Record 324
Meetings of the Royal Geographical Society 336
Geographical Literature of the Month 336
New Maps 346

MAPS.

Sketch-map showing C. W. Hobley's Routes in Rift Valley and Western Laikipia 293
Sketch-map of the Liao River System 298
Sketch-map showing the Route of the Bullock Workman Expedition from Srinagar to the Sources of the Chogo Lungma Glacier, 1902-3 352
Plates of the Bathymetrical Survey of the Fresh-water Lochs of Scotland .. 352
Sketch-map of Part of Unyoro 352

No. 4. *April.*

PAGE

Results of the National Antarctic Expedition:—
I. Geographical (with Portrait, 4 Plates, and Magnetic Chart). By Captain Robert F. Scott, C.V.O., R.N. 353
II. Notes on the Physical Geography of the Antarctic. By H. T. Ferrar, M.A., F.G.S. (with 3 Plates and Sketch-map) 373
III. On the Meteorology of the Part of the Antarctic Regions where the *Discovery* wintered. By Lieut. C. W. Royds, R.N. 387
IV. The Distribution of Antarctic Seals and Birds. By Dr. E. A. Wilson (with 1 Plate) 392
V. Preliminary Report of the Biological Collections of the *Discovery*. By T. V. Hodgson 396
VI. Observations on the Antarctic Sea-ice. By Captain W. Colbeck, R.N.R. (with 2 Plates) 401
The Great Zimbabwe and Other Ancient Ruins in Rhodesia. By Richard N. Hall (with 4 Illustrations) 405
Exploration of Western Tibet and Rudok. By Captain C. G. Rawling (with 5 Plates and Map) 414
Ptolemy's Map of Asia Minor: Method of Construction. By the Rev. H. S. Cronin (with 2 Maps) 429
Reviews:—
EUROPE—British Trade 441
ASIA—Geography of India. The Exploration of Further India. Affairs of Asia 442
AFRICA—African Races. The Masai. Azurara's Chronicle. History of Madagascar 446
AUSTRALASIA AND PACIFIC ISLANDS—Fiji Folk-lore 451
The Monthly Record 451
Obituary 465
Correspondence 468
Meetings of the Royal Geographical Society 469
Geographical Literature of the Month 471
New Maps 475

MAPS.

Sketch-map of Part of the Antarctic Regions, showing Lines of Equal Magnetic Declination (Isogonals) for 1902 357
Sketch-map of Approximate Distribution of the Rocks collected by the National Antarctic Expedition 377
Ptolemy's Map of Asia Minor 432
Map of Asia Minor to illustrate a paper by Rev. H. S. Cronin 433
Map of Part of Western Tibet 480

No. 5. *May.*

The Geographical Results of the Tibet Mission. By Sir Frank Younghusband, K.C.I.E. (with 4 Plates and Map) 481
Exploration in Bolivia. By Dr. H. Hoek (with 6 Illustrations and Map) .. 498
A Trip into the Chili Province, North China. By the Rev. John Hedley (with 6 Illustrations and Map) 513
A Journey West and North of Lake Rudolf. From Notes supplied by J. W. Brooke (with 5 Illustrations and Map) 525
A New Island (with Sketch-map) 531
Glacial Reservoirs and their Outbursts. By Charles Rabot 534
The Indian Earthquake 548
Reviews:—
EUROPE—City Development 549
ASIA—The Literature of the Mission to Lhasa 551
AFRICA—East Africa and its Animal Life 554

PAGE

Reviews (*continued*):—
AMERICA—A Text-book of the Geography of North America. Geology of Alaska. The Geology of Para 558
MATHEMATICAL AND PHYSICAL GEOGRAPHY—New Issue of Huxley's Physiography 559
The Monthly Record 560
Obituary 571
Meetings of the Royal Geographical Society 573
Geographical Literature of the Month 574
New Maps 582

MAPS.

Sketch-map showing the Position of Nii Shima 532
Sketch-map of Part of Tibet, showing Route of the British Expedition to Lhasa, 1904 588
Sketch-map illustrating Exploration in Bolivia 588
Sketch-map illustrating the Journey of Rev. J. Hedley in the Chili Province 588
Sketch-map of the Region West of Lake Rudolf 588

No. 6. *June.*

The Problem of the Upper Yang-tze Provinces and their Communications. By Lieut.-Colonel C. C. Manifold, I.M.S. (with 8 Illustrations and Map) 589
C. Reginald Enock's Journeys in Peru. By Sir Clements R. Markham, K.C.B., President R.G.S. (with Sketch-map) 620
The Ideal Topographical Map. By Major C. F. Close, C.M.G., R.E. 633
Glareanus: His Geography and Maps. By Edward Heawood, M.A. 647
Alpine Railways and International Commerce. By A. J. Sargent (with Sketch-map) 654
The Alexander-Gosling Expedition 658
Reviews:—
AFRICA—Tunis. South Africa. The Hydrography of the Nile 661
AMERICA—A Feature of the Brazilian Coasts 665
MATHEMATICAL AND PHYSICAL GEOGRAPHY—An English Suess 666
GENERAL—The Position of Geography in Science and Education 667
The Monthly Record 670
Obituary 680
Correspondence 683
Meetings of the Royal Geographical Society 685
Geographical Literature of the Month 685
New Maps 696

MAPS.

Map to illustrate Railway Communications through the Alps 655
Map of the Upper Yang-tze Region 700
Sketch-map of Part of Peru 700

The
Geographical Journal.

No. 1. JANUARY, 1905. Vol. XXV.

THE PRESENT PROBLEMS OF GEOGRAPHY.*

By HUGH ROBERT MILL, D.Sc., LL.D.

The present problems of a science may, I hope, be viewed as those problems the solution of which at the present time is most urgent and appears most promising. Were present problems held to include the whole penumbra of our ignorance, I at least have neither the desire nor the competence to discourse upon them. So much has been written on the problems of geography in recent years that a detailed summary of the existing literature would be a ponderous work, and afford much dull and contradictory reading. I cannot even attempt to associate different views of the problems of geography with the names of their leading exponents, though, perhaps, if I were to do so, I should quote with almost entire approval the masterly address recently delivered to the American Association for the Advancement of Science by Prof. W. M. Davis.

Believing that every geographer should approach such a question as this by the avenue of his own experience, I offer a frankly personal opinion, the outcome of such study, research, and intercourse with kindred workers as have been possible to me during the last twenty years. The views I hold may not be representative of European, perhaps not even of British, geographical opinion, except in so far as they are the result of assimilating, more or less consciously, the writings and teachings of geographical leaders in all countries, retaining congenial factors, and modifying or rejecting those which were foreign to the workings of my own partially instructed mind.

* An address delivered to the International Congress of Arts and Sciences at St. Louis on September 22, 1904.

The history of every branch of science teaches that time works changes in the nature and the value of the problems of the hour. In successive ages the waves of existing knowledge made inroads upon the shores of ignorance at different points. For one generation they seem to have been setting, with all their force, against some one selected point; in the next they are encroaching elsewhere, the former problem left, it may be, imperfectly solved; but gradually the area of the unknown is being reduced on every side, however irregularly.

In the beginning of geography, the problem before all others was the figure of the Earth. Scientific progress, not in geography alone, but in all science, depended on the discovery of the truth as to form. No sooner was the sphericity of the Earth established than two fresh problems sprang to the front, neither of them new, for both existed from the first—the fixing of position, and the measurement of the size of the Earth. Geography, and science as a whole, progressed by the failures, as well as by the successes, of the pioneers who struggled for centuries with these problems. Latitude was a simple matter, theoretically no problem at all, but a direct deduction from the Earth's form, though its determination was practically delayed by difficulties of a mechanical kind. The problem of the longitude was far more serious, and bulks largely in the history of science. Pending their solution, the estimates of size were rough guesses; had they been more accurate, it is doubtful if Columbus could have persuaded any sane sailor to accompany him on his westward voyage to India, the coast of which he was not surprised to find so near to Spain as the Caribbean sea.

After latitude could be fixed to a nicety, and longitude worked out in certain circumstances with nearly equal accuracy, the size of the Earth was determined within a small limit of error, and the problem of geography shifted to detailed discovery. This phase lasted so long that even now it hardly excites surprise to see an article, or to open a volume, on the history of geography, which turns out to be a narrative of the progress of discovery. Perhaps British geographers, more than others, were prone to this error, and for a time the country foremost in modern discovery ran some risk of falling to the rear in real geography.

It is not so paradoxical as it seems to say that the chief problem of geography at present is the definition of geography. Some learned men have said within living memory, and many have thought, that geography is not a science at all, that it is without unity, without a central theory, that it is a mere agglomerate of scraps of miscellaneous information regarding matters which are dealt with scientifically by astronomers, geologists, botanists, anthropologists, and others. Geography is not so circumstanced. Although its true position has only recently been recovered from oblivion, it is a science, and one of long standing.

I have said before,* and I may repeat, because I can say it no

* British Assoc. Reports—Presidential Address in Section E. Glasgow, 1901.

better, that modern geography has developed by a recognizable continuity of change from century to century. I am inclined to give more weight than others have done to the remarkable treatise of Dr. Nathanael Carpenter, of Exeter College, Oxford, published in 1625, as a stage in the growth of geographical thought and theory. The striking feature of Carpenter's book is the practical assertion of the claims of common sense in dealing with questions which superstition and tradition had previously influenced. Varenius, who died at the age of twenty-eight, published in 1650 a single small volume, which is a model of conciseness of expression and logical arrangement well worthy even now of literal translation into English. From several points in its arrangement, I am inclined to believe that he was influenced by Carpenter's work. So highly was Varenius's book thought of at the time that Sir Isaac Newton brought out an annotated Latin edition at Cambridge in 1672. The opening definition as rendered in the English translation of 1733 (a work largely spoilt by stupid notes and interpolations) runs—

"Geography is that part of *mixed mathematics* which explains the state of the Earth and of its parts, depending on quantity, viz. its figure, place, magnitude, and motion with the celestial appearances, etc. By some it is taken in too limited a sense, for a bare description of the several countries; and by others too extensively, who along with such a description would have their political constitution."

Varenius produced a framework of Physical Geography capable of including new facts of discovery as they arose; and it is no wonder that his work, although but a part, ruled unchallenged as the standard text-book of pure geography for more than a century. He laid stress on the causes and effects of phenomena as well as the mere fact of their occurrence, and he clearly recognized the influence upon different distributions of the vertical relief of the land. He did not treat of human relations in geography, but, under protest, gave a scheme for discussing them as a concession to popular demands.

As Isaac Newton, the mathematician, had turned his attention to geography at Cambridge in the earlier part of the eighteenth century, so Immanuel Kant, the philosopher, lectured on the same subject at Königsberg in the later part. The science of geography he considered to be fundamentally physical, but physical geography formed the introduction and key to all other possible geographies, of which he enumerated five: *mathematical*, concerned with the form, size, and movements of the Earth and its place in the solar system; *moral*, taking account of the customs and characters of mankind according to their physical surroundings; *political*, concerning the divisions of the land into the territories of organized governments; *mercantile*, or, as we now call it, commercial geography; and *theological*, which took account of the distribution of religions. It is not so much the cleavage of

geography into five branches, all springing from physical geography like the fingers from a hand, which is worthy of remark, but rather the recognition of the interaction of the conditions of physical geography with all other geographical conditions. The scheme of geography thus acquired unity and flexibility such as it had not previously attained, but Kant's views have never received wide recognition. If his geographical lectures have been translated, no English or French edition has come under my notice; and such currency as they obtained in Germany was checked by the more concrete and brilliant work of Humboldt, and the teleological system elaborated in overwhelming detail by Ritter.

Ritter's views were substantially those of Paley. The world, he found, fitted its inhabitants so well that it was obviously made for them down to the minutest detail. The theory was one peculiarly acceptable in the early decades of the nineteenth century, and it had the immensely important result of leading men to view the Earth as a great unit with all its parts co-ordinated to one end. It gave a philosophical, we may even say a theological, character to the study of geography.

Kant had also pointed to unity, but from another side, that of evolution. It was not until after Charles Darwin had fully restored the doctrine of evolution to modern thought that it was forced upon thinking men that the fitness of the Earth to its inhabitants might result, not from its being made for them, but from their having been shaped by it. The influence of terrestrial environment upon the life of a people may have been exaggerated by some writers—by Buckle, in his 'History of Civilization,' for example—but it is certain that this influence is a potent one. The relation between the forms of the solid crust of the Earth and all the other phenomena of the surface constitutes the very essence of geography.

It is a fact that many branches of the study of the Earth's surface which were included in the Cosmography of the sixteenth century, the Physiography of Linnæus, the Physical Geography of Humboldt, and perhaps even the *Erdkunde* of Ritter, have been elaborated by specialists into studies which, for their full comprehension, require the whole attention of the student; but it does not follow that these specializations fully occupy the place of geography, for that place is to co-ordinate and correlate all the special facts concerned so that they may throw light on the plan and the processes of the Earth and its inhabitants. This was clear to Carpenter in 1625, though it has been almost forgotten since.

The principles of geography on which its claims to status as a science rest are generally agreed upon by modern geographers, though with such variations as arise from differences of standpoint and of mental process. The evolutionary idea is unifying geography as it has

unified biology, and the whole complicated subject may be presented as the result of continuous progressive change brought about and guided by the influence of external conditions. It is impossible to discuss the present problems of geography without once more recapitulating the permanent principles.

The science of geography is, of course, based on the mathematical properties of a rotating sphere; but there is force in Kant's classification, which subordinated mathematical to physical geography. The vertical relief of the Earth's crust shows us the grand and fundamental contrast between the oceanic hollow and the continental ridges; and the hydrosphere is so guided by gravitation as to fill the hollow and rise upon the slopes of the ridges to a height depending on its volume, thus introducing the great superficial separation into land and sea. The movements of the water of the ocean are guided in every particular by the relief of the sea-bed and the configuration of the coast-lines. Even the distribution of the atmosphere over the Earth's surface is affected by the relief of the crust, the direction and force of the winds being largely dominated by the form of the land over which they blow. The different physical constitution of land, water, and air, especially the great difference between the specific heat and conductivity or diathermancy of the three, causes changes in the distribution of the sun's heat, and as a result the simple climatic zones and rhythmic seasons of the mathematical sphere are distorted out of all their primitive simplicity. The whole irregular distribution of rainfall and aridity, of permanent, seasonal, and variable winds, of sea climate and land climate, is the resultant of the guiding action of land forms on the air and water currents, disturbed in this way from their primitive theoretical circulation. So far we see the surface forms of the Earth, themselves largely the result of the action of climatic forces, and constantly undergoing change in a definite direction, controlling the two great systems of fluid circulation. These in turn control the distribution of plants and animals, in conjunction with the direct action of surface relief, the natural regions and belts of climate dictating the distribution of living creatures. A more complicated state of things is found when the combined physical and biological environment is studied in its incidence on the distribution of the human race, the areas of human settlement, and the lines of human communications. The complication arises partly from the fact that each of the successive earlier environments acts both independently and concurrently; but the difficulty is in greater degree due to the circumstance that man alone among animals is capable of reacting on his environment and deliberately modifying the conditions which control him.

I have said before, and I repeat now, that the glory of geography as a science, the fascination of geography as a study, and the value of geography in practical affairs, arise from the recognition of this unifying influence of surface relief in controlling, though in the higher

developments rather by suggestion than dictation, the incidence of every mobile distribution on the Earth's surface. I am inclined, in the light of these views, to put forward a definition of geography which I think may be accepted in principle, if not in phrase, by most of the class called by Prof. Davis "mature geographers."

It runs, *Geography is the science which deals with the forms of relief of the Earth's crust, and with the influence which these forms exercise on the distribution of all other phenomena.*

The old pigeon-hole view of human knowledge is now happily discredited and recognized as useless, save perhaps by some Rip van Winkles of science, who concern themselves more with names than things, and would placidly misconceive the facts of nature to fit the framework of their accepted theories. High specialization is necessary to progress, but only as a phase of a working life, not as the whole purpose of a whole man.

It is convenient and often profitable for a man of science to have a recognized label, but it seems to me that important advances are to be made by cultivating those corners of the field of knowledge which lie between the patches where the labelled specialists toil in recognized and respected supremacy. It has been so habitual to classify the man of science by what he works in, that it almost requires an effort to see that the way in which he works is of greater determinative importance. Thus the scientific geographer is apt to find no place in the stereotyped classification, and his work may be lost sight of on that account. Should he dwell on latitude and longitude, the astronomer smiles pityingly; if he looks at rocks, the geologist claims that department; if he turns to plants, the botanist, with the ecologist behind him, is ready to warn him off; and so with other specialists. But the mature geographer seeks none of the territory, and hankers after none of the goldfields belonging to other recognized investigators. He works with the material they have already elaborated, and carries the process a step further, like the goldsmith handling the finished products of the metallurgist and the miner.

The present problems of geography seem to me to be of two kinds: the first minor and preliminary, the completion of the unsolved and partially solved problems of the past; the second ultimate and essential, dealing with the great problem on the solution of which the whole future of the science rests.

The residual problems inherited from the past represent the work which should have been done by our predecessors, but, not having been done at the right time, remains now to bar our progress. It has to do only with ascertaining and accurately recording facts, and involves infinite labour, but comparatively little geographical thought.

To begin with, the ground should be cleared by wiping off the globe the words *terra incognita*. Such unknown parts of the Earth now cling

about the poles alone, and that they should even do this is something of a disgrace. If common terrestrial globes were pivoted on equatorial points, so that the polar areas were not covered with brass mountings, the sight of the bare patches would perhaps have been so galling to the pride of humanity that they would long since have been filled in in detail. Again and again, and never more splendidly than in recent years, polar explorers have shown courage and perseverance, and have cheerfully encountered hardships enough to have enabled them to reach the poles, and they would have done so, not once, but many times, were it not for the want of money. Of course, all polar explorers have not been competent for the task they undertook, but most of the leaders, if they had had more powerful ships, more coal, more stores, more dogs—and sometimes if they had had fewer men—could have solved these perennial problems of exploration. With a competent man in command—and competent men abound—a sufficiency of money is all that is required. A million dollars judiciously spent would open the way to the north pole, a few millions would reach the south pole; but far more than this has been spent in vain because the money was doled out in small sums at long intervals, sometimes to explorers with no real call to the quest, and working in accordance with no scientific plan.

The grand journeys over the polar ice of Nansen, Peary, and Cagni in the north, and of Scott and his company in the south, promise well for an early solution of this particular problem.

The other residual problems of exploration and survey are in the same case. If those who control money saw it to be their duty to solve them, they would all be solved, not in a year, but in due time. Though a great deal of exploration remains to do, the day of the ignorant explorer is done. The person who penetrates a little-known country in search of adventures or sport, or in order to go where no one of his colour or creed had been before, is, from the geographical point of view, a useless wanderer; and if he be a harmless wanderer, the true explorer who may follow in his footsteps is uncommonly fortunate. Exploration now requires, not the pioneer, but the surveyor and the student.

The map of the world ought to be completed, and it is the duty and, I believe, the interest of every country to complete at least that portion which includes its own territory. An imperial policy which ignores such an imperial responsibility is a thing of words, and not of deeds. Unsurveyed and unmapped territory is a danger, as well as a disgrace, to the country possessing it, and it would hardly be too much to say that boundary disputes would be unknown if new lands were mapped before their mineral wealth is discovered. The degree of detail required in any survey depends upon the importance of the region. The desideratum is not a large-scale map of every uninhabited island, but a map of the whole Earth's surface on the same scale, which for the present may be

a small one, and might very well be that of 1 : 1,000,000 proposed by Prof. Penck, and now being carried into effect for the surveyed portions of the land. Such a map ought to include sub-aqueous as well as sub-aërial features, and when completed it would form a solid basis for the full discussion of many problems which at present can only be touched upon in a detached and unsatisfactory manner. The first problem which it would solve is the measurement of the volume of the oceanic waters and of the emergent land, so that the mean depth of the oceans and the mean heights of the continents might be exactly determined. This would involve, besides the horizontal surveys, a vertical survey of considerable accuracy. At sea the vertical element is easily found, and the depths measured by surveying and exploring vessels in recent years are very accurate. They must, however, be made much more numerous. On land, outside the trigonometrically surveyed and spirit-levelled countries, the vertical features are still most unsatisfactorily delineated. Barometric determinations, even when made with mercurial barometers or boiling-point thermometers, are uncertain at the best, while when made with aneroids they afford only the roughest approximations to the truth. Where levelling is impracticable, angular measurements of prominent heights, at least, should be insisted on as an absolute necessity in every survey.

When a map of the whole surface of the Earth on the scale of 1 : 1,000,000 is completed, we may consider the residual problems as solved. This is far from being the case as yet, and in the present circumstances the most useful work that the geographical societies of the world could do would be to secure the completion of explorational surveys to that scale. The system of instruction for travellers established by the Royal Geographical Society has equipped a large number of explorers and colonial officials as expert surveyors, and the result is now being felt in every quarter of the globe. This is not the highest geographical work, but merely preliminary and preparatory; yet progress is checked, if not barred, until it is accomplished. The map of one to a million is not to be viewed as an end in itself; nevertheless, its completion will mark an era, the accomplishment of the small-scale survey of the globe, and permit of fresh advances.

Money could solve the last of the problems of exploration, but when we come to problems of the second category we enter a region of pure science, where money becomes a minor consideration. The acquisition of knowledge is a simple process, for which multitudes have a natural aptitude; but the co-ordination of knowledge and its advancement are very different matters. The difference is more marked in the case of geography than in geology or chemistry or physics, for, in English-speaking countries at least, the training of geographers is in its infancy, whilst that of the exponents of other sciences is highly developed. Hence it happens that before any actual problem in geography can be

attacked, the man who is to deal with it must be prepared on purpose for the task, and he must have determination enough to stick to an unpopular subject with little encouragement in the present and small prospects for the future. Such men are not very easily found.

If they can be found, the problems they should be set to solve are at hand and waiting. We know enough about the relations of mobile distributions to fixed environments to feel satisfied that the relations are real and of importance; but we do not yet know enough to determine exactly what the relations are and the degree in which they apply to particular cases. It is the province of geography to find this out, and to reduce to a quantitative form the rather vague qualitative suggestions that have been put forward. The problem is multiform and manifold, applying to a vast range of phenomena, and those who have surveyed it are often inclined to sigh for a Kepler or a Newton to arise and call order from the chaos.

A vast amount of material lies before the geographer with which to work, even though, as has been explained, much more is needed before the data can be looked upon as complete. After seeing that the missing facts are in course of being supplied, the great thing is to work and to direct the work of others towards the proper comprehension of the facts and their bearings. This involves as much the checking and discouragement of work in wrong or useless directions as the help and encouragement of well-directed efforts.

The first element of geography is the configuration of the crust of the Earth, and our knowledge is already ripe for a systematic classification of the forms of the crust, and for a definite terminology by which to describe them. For some reason, not easy to discover, geographical terms, with the exception of those handed down from antiquity, have not, as a rule, been taken from the Greek like other scientific terms. They have usually been formulated in the language of the author who has introduced them. For this reason they retain a national colour, and, absurd as it may seem to scientific reflection, national or linguistic feeling is sometimes a bar to their general adoption. A more serious difficulty is that different languages favour different modes of thought, and thus lead to different methods of classification. The clearness and definiteness of French conduces to the use of simple names, and the recognition of definite features distinguished by clear differences. The facility for constructing compound words presented by German lends itself to the recognition of composite types and transition forms, the introduction of which often swells a classification to an almost unmanageable complexity. English stands intermediate between those languages, less precise perhaps than French, certainly less adaptable than German, and English terminologies often reflect this character. The best way out of the difficulty seems to be to endeavour to arrive at a general understanding as to a few broad types of land form which are recognized by

every one as separate and fundamental, and then to settle equivalent terms in each important language by an international committee, the finding of which would have to be ratified by the national geographical societies. These terms need not necessarily be identical, nor even translated literally from one language into another, but their equivalence as descriptive of the same form should be absolute. A recent international committee appointed for the nomenclature of the forms of sub-oceanic relief put forward certain suggestions in this direction which might well be adapted to the forms of sub-aëriel relief as well. But there are strong-willed geographers who will recognize no authority as binding, and who will not, I fear, ever conform to any scheme which might threaten their liberty to call things as they please.

Personally, I would go very far to obtain uniformity and agreement on essential points, but the only way to do so seems to be to arrive by general consent at a classification that is as brief, simple, and essential as possible.

It is necessary to classify land-forms according to their resemblances and differences, so that similar forms may be readily described, wherever they may be. The fixed forms of the crust are the foundation of all geography, the ultimate condition underlying every distribution, the guiding or controlling resistance in every strictly geographical change. The question of place-names is altogether subordinate. It is convenient that every place should have a name, and desirable that the name should be philologically good, but the national boards of geographic names, geographical societies, and survey departments see to that, and do their work well. The question of terminology is far more difficult and, I think, more pressing.

The grand problem of geography I take to be the demonstration and quantitative proof of the control exercised by the forms of the Earth's crust upon the distribution of everything upon the surface or in contact with it which is free to move or to be moved. It is a great problem the full solution of which must be long delayed, but every part of it is abud with minor problems of detail, alike in nature, but differing widely in degree. These minor problems claim our attention first, and are so numerous that one fears to attempt their enumeration because of the risk of distracting attention from the main issue. Geography was defined long ago as the science of distribution; but the old idea was statical distribution, the laying down on maps of where things are; now we see that we ought to go further, and discuss also how the things came there, why they remain there, whether they are in transit, and, if so, how their path is determined. We are learning to look on distribution from its dynamical side, the Earth with all its activities being viewed as a machine at work. The geographer, as an independent investigator, has to deal only with matters touching or affected by the crust of the Earth; his subject is limited to a part only of the economy

of the Kosmos, a fact that sometimes seems to be in danger of being forgotten.

The quantitative relationships of crustal control have to be worked out for different areas with different degrees of detail. A great deal has been done already, and the material for much more has been collected in a form fit for use. The first step in commencing such a discussion is the accurate mapping of all available data—each kind by itself—for the particular area. On the national and almost continental scale, this is done better in the United States Census Reports than in any other works known to me. An adequate discussion of all that is shown in the maps accompanying these Reports, and in those of the Coast and Geodetic Survey, the Geological Surveys, and the Department of Agriculture, would be almost an ideal geographical description. The material provided in such rich profusion by the Federal and State governments is being used in American universities with an originality and thoroughness that has developed the conception of geography and advanced its scientific position. American geographers more than others have grasped the dynamic idea of geography, and realized that the central problem is the elucidation of the control or guidance exercised by fixed forms on mobile distributions.

Detailed work in the same direction has been done by many European geographers whose works are too well known to require citation; but the geographical treatment of statistics has not been taken up adequately by public departments in the countries east of the Atlantic. I will touch only on the instance most familiar to me. Except the publications of the Admiralty, Ordnance and Geological Surveys, which cannot be surpassed, the maps issued by British Government Departments in illustration of their reports are rarely more than diagrams delimiting the areas dealt with, but not depicting the distributions. This is the more regrettable because the accuracy and completeness of the statistics in the reports are inferior to none, and superior to most work of a similar character in other countries. As frequently happens, private enterprise has stepped in where official action is wanting, and it is a pleasure to the geographer to turn to the recent maps of Mr. J. G. Bartholomew, especially the volume of his great Physical Atlas, the Atlas of Scotland published some years ago, and the Atlas of England and Wales which has just left the press. Both of the latter works contain general maps based on statistics that have not been subjected to cartographic treatment before, and attention may be drawn in particular to the singularly effective and suggestive mapping of density of population. Another work similar in scope and no less creditable to its compilers is the Atlas of Finland, prepared by the active and enlightened Geographical Society of Helsingfors. In Germany, France, and Russia also examples may be found of good work of this kind, sufficient to whet the desire for the complete and systematic treatment of each country on the same lines.

It seems to me that the most useful application of youthful enthusiasm in geography, such as breaks forth in the doctorial theses of German universities, and is solicited in the programme of the Research Department of the Royal Geographical Society, would be towards the detailed comparison of the distribution of the various conditions dealt with statistically in Government Reports with the topographical map of selected areas. The work would, of course, not stop with the maps, for these, when completed, should be tested and revised as fully as possible on the ground, since geography, be the scale large or small, is not advanced by maps alone.

Such small portions of the co-ordination of existing surveys are, at the best, no more than fragments of a complete scheme, but they show what can be done with existing surveys and actual statistics, and indicate where these may be appropriately reinforced by new work. I have treated a special case of this kind pretty fully in papers to which it is only necessary to refer.* One section of the scheme outlined and exemplified in these papers is the distribution of rainfall viewed in relation to the configuration of the land, and with the active assistance of nearly four thousand observers in the British Isles, I feel that there is some prospect, though it may lie far in the future, of ultimate results from that study.

The system of botanical surveys now being carried on with signal success in many countries is in some ways even more interesting. It includes the mapping of plant associations and the discussion of their relation to altitude, configuration, soil, and climate. Such phenomena are comparatively simple, and the influence of the various modifications of geographical control is capable of being discovered. I need only mention the similar problems in animal distribution, both on land and in the sea, to the elucidation of which many able workers are devoting themselves.

Difficulties increase when the more complicated conditions of human activity are taken into account. The study of the geographical causes determining, or assisting to determine, the sites of towns, the lines of roads and railways, the boundaries of countries, the seats of industries and the course of trade, is full of fascination and promise. It has yielded interesting results in many hands; above all, in the hands of the leading exponent of anthropogeography, the late Prof. Ratzel, of Leipzig, whose sudden death last month is a grievous loss to geographical science. Had he lived he might have carried the lines of thought, which he developed so far, to their logical conclusion in the formulation of general laws of universal application; but that task devolves on his disciples.

Separate efforts in small and isolated areas are valuable, but a

* *Geographical Journal*, 7 (1896), 345-364; 15 (1900), 205-226, 353-377.

much wider basis is necessary before general principles that are more than hypotheses can be deduced. For this purpose there must be organized co-operation, international if possible, but, in the present condition of things, more probably on a national footing for each country. To be effective, the work would have to be on a larger scale and to be continued for a longer time, than is likely to appeal to an individual or a voluntary association. One experienced geographer could direct an army of workers, whose task would be to collect materials on a properly thought-out plan, and from these materials the director of the work could before long begin to produce results, probably not sensational, but accurate and definite, which is far better. The director of such a piece of work must be free to disregard the views of the collectors of the facts with which he deals, if, as may very well happen, these views are at variance with scientific principles.

A complete geographical description should commence with a full account of the configuration of the selected area, and in this I lay less stress than some geographers feel it necessary to do upon the history of the origin of surface features. The features themselves control mobile distributions by their form irrespective of the way in which that form was produced, and although considerations of origin are often useful and always interesting, they are apt to become purely geological. The second point to discuss is the nature of the actual surface, noting the distribution of such geological formations as volcanic rocks, clays, limestones, sandstones, and economic minerals, the consistency and composition of the rocks being the points to which attention is directed, the geological order or age an entirely subordinate matter. To this must be added a description of the climate as due to latitude, and modified by altitude, exposure, and configuration. Then the distribution of wild and cultivated plants in relation to their physical environment, and of the industries depending on them and on other natural resources. As the conditions increase in complexity, historical considerations may have to be called in to aid those of the actual facts of to-day. The lines of roads and railways, for example, are usually in agreement with the configuration of the localities they serve; but anomalies sometimes occur the explanation of which can only be found by referring to the past. The more transitory features of a country may have acted differently at different times in affording facilities or interposing barriers to communication. The existence of forests long since destroyed, of marshes long since drained, of mineral deposits long since worked out, or of famous shrines long since discredited and forgotten, account for many apparent exceptions to the rules of geographical control. In long-settled countries the mobile distributions do not always respond immediately to a change of environment. A town may cease to grow when the causes that called it into existence cease to operate, but it may remain as a monument

to former importance and not wither away. As one ascends in the geographical system, the mobility of the distributions which have to be dealt with increases, the control of crust-forms upon them diminishes and non-geographical influences come more and more into play. It may even be that causes altogether outside of geographical control account for the persistence of worn-out towns, the choice of sites for new settlements, or the fate of existing industries. If this be really so, I think it happens rarely, and is temporary. Geographical domination, supreme in simple conditions of life, may be modified into geographical suggestion; but in all stable groupings or continuous movements of mankind the control of the land on the people will surely assert itself. How? and To what degree? are the questions to which the modern geographer must seek an answer.

A special danger always menaces the few exponents of modes of study which are not yet accepted as of equal worth with those of the long-recognized sciences. It is the Nemesis of the temptation to adopt a plausible and probably true hypothesis as the demonstrated truth, and to proclaim broad and attractive generalizations on the strength of individual cases. Geographers have perhaps fallen into the error of claiming more than they can absolutely prove in the effort to assert their proper position; but the fault lies mainly at other doors. In geography it is not always easy to obtain exact demonstrations or to apply the test of accordance with fact to an attractive hypothesis; and it is necessary to be on guard against treating such speculations as if they were truths. The methods of journalism, even of the best journalism, are to be absolutely discouraged in science. The new is not necessarily truer or better than the old simply because it is new, and we must remember that time alone tests theories. It is a danger to become too popular. The scientific study of geography should be carried on with as many safeguards of routine verification and patient repetition, and it may be within as high a fence of technical terminology, as, say, physiology, if the proper results are to be obtained. Unfortunately, the idea is prevalent that geography is an easy subject, capable of being expounded and exhausted in a few popular lectures. I regret to see the growing tendency amongst teachers of geography to deprecate the acquisition of facts, to shorten and "simplify" all chains of reasoning, to generalize over the heads of clamant exceptions, and even to use figures, not as the ultimate expression of exact knowledge, but merely as illustrations of relative magnitude. I quite allow that all this may be legitimate and laudable in the early stages of elementary education, but it should never pass beyond, and every vestige of such a system of evading difficulties should be purged from the mind of the aspirant to research.

The facts available for the advancement of geographical science are neither so well known nor so easily accessible as they should be.

Much has been done towards the indexing of the current literature of all sciences, and geography is peculiarly fortunate in possessing the exhaustive annual volumes of the *Bibliotheca Geographica*, published by the Berlin Geographical Society, the carefully selected annual bibliography of the *Annales de Géographie*, the critical and systematic chronicles of the *Geographische Jahrbuch*, and the punctual monthly lists and reviews of the *Geographical Journal* and *Petermanns Mitteilungen*, not to speak of the work of the 'International Catalogue of Scientific Literature.' A great desideratum is an increase in the number of critical bibliographies of special subjects and particular regions, prepared so carefully as to relieve the student from the necessity of looking up any paper without being sure that it is the one he requires to consult, and to save him from the weary labour of groping through many volumes for fragmentary clues. In addition to the sources of information usually catalogued in one or other of the publications cited, there exist in every country numbers of Government reports and quantities of periodical statistics too valuable to deserve their usual fate of being compiled, printed, stored away, and forgotten. There is scope for a great deal of hard but very useful and permanently valuable work, in throwing all these open to working geographers by providing analytical indexes. This would make it easier to discuss current Government statistics with the highest degree of precision, and to compare past with present distributions. All such statistics should be subject to a cartographical treatment no less rigidly accurate than the ordinary arithmetical processes.

The ultimate problem of geography may perhaps be taken as the determination of the influence of the surface forms of the Earth on the mental processes of its inhabitants. But a host of minor problems must be solved in cutting the steps by which that culmination may be reached. Let us first find, if possible, what is the true relation between the elevation, slope, and exposure of land and climate; then the exact influence of elevation, slope, soil, exposure, and climate on vegetation; then the relation between all these and agriculture, mining, manufactures, trade, transport, the sites of towns, the political associations of peoples, and the prosperity of nations. After that we may consider whether it is possible to reduce to a formula, or even to a proposition, the relation between the poetry or the religion of a people and their physical surroundings. The chemist Chenevix wrote a book in two volumes a hundred years ago to demonstrate the inferiority of a particular nation, against one of whom he bore a personal grudge, and he was bold enough to attempt to justify the formula $C = f\lambda$, where C represented civilization, λ the latitude, and f a function so delicately adjusted as to make the value of C negative on one side of a channel 20 miles wide and positive on the other! We cannot hope to arrive by any scientific process at so definite a formula, but the only way of getting there at all is by forging the links in a chain of cause and effect as

unbroken as that which led from the "house that Jack built" to the "priest all shaven and shorn."

The last of the problems of geography on which I intend to touch is that of the training of geographers. So far as elementary instruction in geography is concerned I have nothing to say, except that it was bad, it is better, and it seems likely that it will be very good. But between geography as part of the education of a child and geography as the whole life-work of a man there is a gulf as wide as between nursery rhymes and the plays of Shakespeare. The training of an elementary teacher in geography should be more thorough and more advanced than that of a child, but it need not be of a different order. The teacher, whose special function is teaching, must, like the child, accept the facts of geography from the authorities who are responsible for them. Although the two gifts are sometimes happily combined, an excellent teacher may make but a poor investigator.

A would-be geographer has at present adequate scope for training in very few universities outside Germany and Austria. Great advances have been made in the United States, but it is only here and there amongst the universities that steps have been taken to secure men of the first rank as professors, who are not only channels of instruction, but masters of research as well. In the United Kingdom there are lecturers on geography at several universities and many colleges; and although they have done good work, the system adopted fails, in my opinion, on a practical point—the lecturers are so inadequately paid that they cannot afford to give their whole time or their undivided attention to the subject with which they are charged. In such conditions progress cannot be rapid, and research is almost impossible. The absence of any well-paid posts, by attaining which a geographer would be placed in a position equivalent to that of a successful chemist or mathematician or botanist, kills ambition. The man with his income to make cannot afford to give himself wholly to such a study, however great his predilection for it. The man with as much money as he needs rarely chooses "to scorn delights and live laborious days;" and—with some bright exceptions—he has a tendency, when he turns to science at all, to study it rather for his own satisfaction than for the advance of the subject or the help of his fellows. We want some adequate inducement for solid scientific workers, well trained in general culture, and fitted to come to the front in any path they may select; to devote their whole attention—and the whole attention of such men is a tremendous engine—to the problems of geography. The labourer is worthy of his hire, and the services of the most capable men cannot reasonably be expected if remuneration equivalent to that offered to men of equal competence in other subjects is not available. At a few American and several German universities such men can receive instruction from professors who are masters of the science, free to undertake research themselves,

and to initiate their students into the methods of research—the best training of all. If the time should come when there are, perhaps, a dozen highly paid professorships in English-speaking countries, several dozen aspirants will be found, including, we may hope, a few more gifted than their masters, all qualifying for the positions, stimulated by rivalry, and full of the promise of progress. This is not an end, but the means to an end. Rapid progress is impossible without the stimulus of the intercourse of keenly interested and equally instructed minds. Geography, like other sciences, has to fight its way through battles of controversy, and smooth its path by wise compromises and judicious concessions, before its essential theory can be established and universally accepted. We already see, though somewhat dimly, the great principles on which it depends, and they are becoming clearer year by year. As they are being recognized they may be applied in a provisional way to current problems of practical life. The world is not yet so fully dominated by the highest civilization, nor so completely settled, as to deprive geographers of an opportunity of showing how the settlement and development of new lands can best be carried out in the light of the permanent relationships between land and people discovered by the study of the state of matters of long-settled areas at the present day and in the past.*

The practical politician, unfortunately, thinks little of geographical principles, and hitherto he has usually neglected them utterly. Many burning questions that have disturbed the good relations and retarded the progress of nations, even when they did not burst into the conflagration of war, would never have got alight had the consequences of some apparently trifling neglect, or some careless action, been understood beforehand as clearly by the man of affairs as by the student of geographical principles. Perhaps, when geography has obtained the status in the world of learning to which its ideals and achievements entitle it, the geographer may more frequently be invited, when the occasion demands, to assist by his advice in saving his country from extravagance or disaster.

GEOGRAPHY AND EDUCATION.

The Council of the Society have recently been making renewed efforts to secure the better teaching and fuller recognition of geography in our educational system. By issuing suggestions for syllabuses in primary and secondary schools, by renewing their grants to Oxford and Cambridge, and by approaching the various authorities who control

* For a development of this suggestion, see the author's 'New Lands' (London: Charles Griffin. 1901).

examinations, they have endeavoured to call attention to the needs of the times, and as far as they can to meet them.

In November the *Times* published an incisive article by its military correspondent on geography and war, supported by a vigorous leading article, which led to a discussion that can hardly fail to produce good results.

The *Times* correspondent began his article by pointing out that in his opinion the lessons of the South African war had not yet been learned by the Intelligence Department of the War Office. It had taken no steps to prepare and distribute a map of the theatre of war in the Far East which could be read by our officers, most of whom could not be expected to decipher the names on the Russian and Japanese staff maps, even if they were able to obtain them. This should have been done, not merely to enable our military men to follow the history and learn the lessons of this great war more intelligently, but to familiarize them with a country in which, considering our close alliance with one of the belligerents, it was not impossible that they might be called upon to fight themselves. Even the maps issued by our public departments were a disgrace (a criticism which is not true of the publications of the Ordnance Survey, though it is not too strong a term for certain official maps). He gave a number of striking examples of the costly and occasionally tragic consequences of inaccurate maps, *e.g.* in marches through little-known countries, or in laying the Abu Hammad railway, and hinted that the ignorance of ministers had contributed to the misleading of armies. Even important official maps were not always known to the authorities, and the Colonial Office was said to have supplied a German map to an officer under orders for Nigeria, in ignorance of the existence of the War Office map!

"How could knowledge or interest in such matters be expected as long as they are considered of no account in our educational system? It is not possible to deal rationally with military history or strategy, past or present, without knowledge of geography and of theatres of war, and without maps. Yet the systematic study of these branches of learning has been rigorously excluded from the programmes of our military colleges and universities, and remains excluded to the present hour."

The practical lesson of this, he insisted, was that the teaching of geography must be put on a new basis.

"We have suffered, and we shall continue to suffer, in the conduct of military operations, because the teaching of geography has not assumed its proper place in national education, and because the learning of it is not widespread. The interest of the army in this matter is solid with politics, commerce, and finance."

In civil education the same indifference is shown, and "even in the very subsidiary *rôle* of handmaid of history, geography, in some exalted quarters, finds no place." He cited the mapless Cambridge history as an example of this, and he might have noted that though the Victoria

histories of English counties, in their anxiety to omit nothing, include chapters on geology and even on butterflies, yet have no systematic account of the geographical conditions which have exercised a permanent controlling influence on the local history.

"On all sides the neglect of geography leaves a trail of harm. It gives us constant friction in our international relations, and not infrequent wars; it leads our business houses into costly mistakes, and into sins of omission and commission; it does as much as anything else to permit immoral financiers to drain the capital of England by nefarious schemes; it leads to reckless writing in the press, and to the isolation of England in a hostile world."

What, then, is being done by the educational authorities to remedy this undesirable state of things? Unfortunately, he thinks, very little.

"Nothing is more extraordinary than the thesis of the War Office and the Civil Service examiners that for soldiers, administrators, missionaries, and merchants, who have to conquer, develop, reclaim, or exploit a real world, scientific study of that world is superfluous. Can we not all see that in such a theatre as Manchuria, for example—and all theatres of war are alike in this respect—an intelligent classification of ground forms, knowledge of the climate and its influence on the surface of the ground, and on the economic conditions of the campaign, are of the utmost importance? These and hundreds of other points of practical utility are taught by geography; but our system, on the whole, is either not to teach it at all, which has the merit of simplicity, or to pass it round to geologists, economists, historians, or perhaps even to topographers, and to consider we have done something of which we may worthily be proud."

He then gave a review of geographical teaching in our universities, which hardly did justice to the existing conditions as revised in the last year. The present facilities are outlined in an article in the *Geographical Teacher* for October, 1904, and need not be given here. For recent progress we are all thankful, and nothing is more cheering than the growing recognition of the value of the study of geography as an integral part of the historical and economic courses at our universities, although it is still inadequate. Geography is considered too often from a purely topographical or product-distribution point of view, and is introduced for the information it supplies rather than as a discipline which is essential for every student of history or economics who wishes to interpret as well as to record. All university teaching is hampered, moreover, by the student's want of preliminary training, by inadequate endowment, and by the lack of sufficient recognition of the subject towards a university degree.

How is this to be remedied? The correspondence revealed differences of opinion. The *Times* correspondent considered that geography was indispensable to any intelligent man living and acting in the twentieth century, and seemed to think it natural that schools and universities should co-operate in a joint plan of action.

Representatives of the older universities were the first to take up the points raised by the *Times* correspondent, very largely in the form

of a protest that the writer had not done justice to the encouragement which was actually being given by the universities to the subject, a criticism to which, as we have already pointed out, he had unfortunately laid himself open. Except in the case of Mr. Mackinder's letter, this criticism on a single point appears to have been regarded as an adequate answer to all the other points on which the position of the *Times* correspondent was unassailable. Mr. Mackinder, however, while laying equal emphasis on the fact that progress is slowly being made in the universities, was evidently anxious not to put the demand for increased facilities in a form which could not, in the present state of our educational machinery, be introduced except after considerable delay. He insisted very strongly on the importance of the War Office requiring geography as an essential part in the school and subsequent training of officers, as this would correct an existing defect in our military educational system and create a demand for teachers of geography to which the universities must necessarily respond. His attitude throughout was that of the practical administrator who desires to ask for nothing which there is not a reasonable prospect of obtaining, and who fears that by asking too much he may get too little.

The representatives of the Geographical Societies naturally took a more comprehensive view. Our President, in an admirable letter, traced the history of the efforts which have been made by the Society to promote the teaching of geography, including large subsidies to the universities. In the course of his letter he said, "It is no secret that the Council of this Society has been in communication during the last few months with the leading Government Departments, with a view to inducing them to accord geography the place which it admittedly ought to have in their examinations. While certain of the Departments recognize the subject, none of them accord it the independent and substantial position which it ought to hold. The Civil Service Commissioners excused themselves on the ground that the moment was inconvenient for change, and that the subject was not fully recognized in University degrees and in public schools. They underestimate, I think, the present position of geography at the older Universities; but apart from this, may I express a doubt as to their attitude being a reasonable one? Surely the Government departments can easily convince themselves of the value of geography, if they are not already convinced; and, if they come to a favourable conclusion, is it not to their interest and their duty to insist that it be accorded an independent place, carrying substantial marks in their various examinations? If this were done schools and Universities would lose no time in responding to the new conditions."

Dr. Keltie, interviewed by a *Morning Post* correspondent, also gave an account of the work done by the Society since his well-known report in 1884. He showed that, while geography was much more widely

recognized now than twenty years ago, there were still many difficulties to overcome. In addition to the School of Geography at Oxford, a Board of Geographical Studies now existed at Cambridge, and this Board was at present engaged in drawing up a scheme for a special university examination in geography. Another great advance was in the making of military geography a compulsory subject in the entrance examination of the Staff College, ranking equally with military history and with strategy. But, on the whole, the replies of various Government Departments to the recent representations of the Council of the Royal Geographical Society were not very encouraging. While this country ought to be the pioneer in geographical science and teaching, it was still behind foreign rivals, especially the Germans, who constantly scored points because they were so much better educated geographically. In one matter, however, we were the leaders, for the Royal Geographical Society's diploma in surveying was being taken by more students, both military and civil, every year, and last year Mr. Reeves had almost fifty students, including a number of foreigners, some of them Germans, who could not get such a practical training in their own country.

Sir Clements Markham's letter drew a reply from one of the Civil Service Commissioners, who maintained that geography was an examination subject for all candidates except those for the higher appointments, and that in the present state of university recognition of the subject it was useless to demand geography from such candidates.

Mr. Freshfield retorted that the first duty of the Civil Service Commissioners was not to acquiesce in the present public school and university conditions, but to satisfy themselves that every candidate for employment in the public service possessed, as was explicitly stated in their instructions, "the requisite knowledge and ability to enter upon the discharge of his official duties."

Mr. Mackinder, in a second letter, reaffirmed that the military recognition of geography would speedily result in the other authorities falling into line.

Dr. Herbertson pointed out that even if the contention of the Civil Service Commission had hitherto been valid, it could scarcely be maintained much longer. He suggested that successful candidates for Indian, Colonial, and Foreign Office appointments should be required to take a course of geographical instruction before entering on their duties, and pointed out that this could be done without disturbing existing interests.

The subject thus opportunely brought to the notice of the public by the *Times* is not to be allowed to remain a mere expression of pious opinion. The Council of the Society has decided that another letter should be drafted by the Education Committee, and addressed to the various Government Departments, urging that the importance of geography in the public services is such that all candidates for entry into

these services should be required to qualify in geography as a separate subject, and that it ought to be recognized in all public examinations that geography is an independent subject, in which a separate paper of examination should be set, carrying such a proportion of marks as to make geography a first-class subject. They also point out that it is a mistake for the Civil Service Commissioners to wait until the subject is more fully recognized in universities and public schools; that if the various Government Departments are convinced of the value of the subject, they ought to insist on its being accorded a substantial place in their examinations, and as a consequence the effective teaching of the subject would become universal.

The Council has further decided to devote the evening meeting of January 23 to a conference on the subject, to be opened by the President, and to take steps to secure the attendance of those specially interested.

It is obviously impossible at the present moment to see what will be the outcome of these endeavours. In the case of military education, however, there need be no delay, as it cannot, with any show of plausibility, be argued that the soldier can dispense with geography. Decisive action by the War Office, as Mr. Mackinder has shown, is the key to the position, and reform once granted in this direction, it cannot be long before it is accorded in the various departments of civil life.

Perhaps the most significant and important point really is that such a correspondence should have been initiated and carried on, not in one of the technical journals, but in the columns of the *Times*. The geographer, however high his reputation, must always, in urging the claims of this subject, be open to the insinuation that he has a personal end to gain. When, however, public attention is called to the subject by an official article in the columns of a newspaper like the *Times*, it is clear that no purpose beyond the consideration of our imperial needs can possibly be the inspiring motive; and there would seem to be reason to hope that the long and thankless campaign of the geographical societies to arouse enthusiasm in the subject in the educational world, as well as in the public generally, may at last be within reach of success.

THE MOUNTAINS OF TURKESTAN.

By ELLSWORTH HUNTINGTON.

Introduction.

PART I.—PHYSIOGRAPHY.

The Tian Shan Plateau.
Location and World Relations.
Climate.
The Plateau Character of the Tian Shan—Scenery.

The Alai Region.
Glaciation.
Terraces and their Relation to the Glacial Period.

PART II.—ONTOGRAPHY.

Ontographic Relations.
Vegetation.
Animal Life.
The Ontographic Relations of Human Life.
Physiographic Conditions of Permanent Nomadism.
The Nomadism of Tian Shan.
The Khirghiz Nomads.
Domestic Animals.
Dwellings.
Migrations.
Furniture.
Utensils.
Dress.
Art.
Food and Habits of Eating.
Hospitality.
Khirghiz Sports.
The Nearness of the Khirghiz to Nature.
The Khirghiz and Civilization.
The Position of Women.
Conclusion.

IN common usage, the name Turkestan is applied to all of the vast region from the Caspian sea eastward for nearly 2000 miles to the vicinity of Lob Nor, in the very centre of Asia. The people of the region, however, apply the name in a more limited sense to the tract, largely mountainous, lying south of Lake Balkash between longitudes 70° and 80° east of Greenwich. In the eastern part of this more restricted area lies the lofty plateau of western Tian Shan, while just to the south lies the great Alai range on the northern edge of the Pamirs. Among these mountains, in company with the Khirghiz who inhabit them, the writer travelled for three months during the summer of 1903 under the auspices of the Carnegie Institution of Washington. The journey led from Andijan at the end of the railroad in Ferghana across the Tian Shan mountains to Issik Kul, around the northern side of Issik Kul, and again across the Tian Shan to Kashgar, in the desert basin of Chinese Turkestan. From Kashgar the route was west and north over the Terek range which connects the Tian Shan and Alai mountains, and then south across the Alai range to the valley of the same name and back across the mountains to Margelan, the capital of Ferghana.

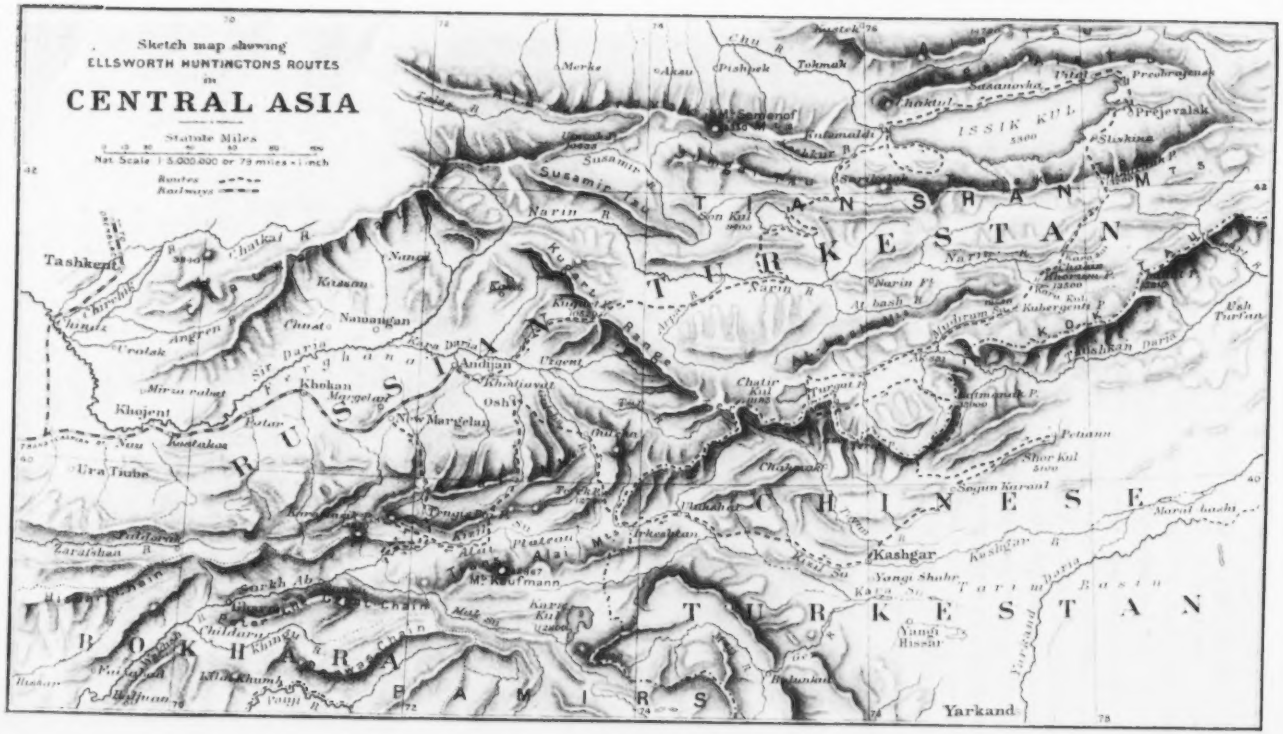
The following paper is an account of the geography of the two closely similar mountain regions of Turkestan, viz. the Tian Shan plateau and the Alai range. I shall present first their *physiography*, a description of

the inanimate features, and then their *ontography*, a description of the animate features. In the second half of the subject, ontography, I shall attempt to point out the causal relation that exists between the facts of physiography and those of life, for it is only in such a study of relations that geography becomes really a science. The present paper is not supposed to be a complete geographical treatment of the regions involved. In the first place, such a treatment is to-day impossible, because the study of the relation between the inanimate facts of physiography and the animate facts of ontography is still in its infancy. We know but a modicum in respect to the influence of environment on habit, and almost nothing of the higher and more fascinating reaches of the subject, the influence of geographic environment on human character. In the second place, this paper is incomplete, because it is based merely on the writer's own observations, without reference to the work of others. Such an incompleteness of treatment may perhaps be excusable in a case where the country in question is so little known, and the writer is still in Central Asia.

The Tian Shan Plateau.

Location and World Relations.—From the Pamirs, the lofty roof of the world, three great mountain masses diverge eastward. The Tian Shan plateau, the northern of these, forms a roughly anvil-shaped mass, with the longer end projecting eastward north of the inhospitable Tarim basin, and the smaller end projecting westward and enclosing between itself and the Pamirs the fertile basin of Ferghana. Between the Tarim and Ferghana basins lies the Terek range, the neck of the anvil, not perpendicular to the head, but bent to the north-east. Few parts of the world are by nature more inaccessible than the Tian Shan plateau, for not only does it lie in the centre of the greatest continental land mass, but its axis lies along the centre of the desert belt caused by the obliquely rotating winds of the northern hemisphere. The distance from the sea is great in every direction, and wherever the contiguous regions are not closely associated with high mountains, they assume the form of broad desert plains.

Climate.—In such a region climatic contrasts must be the rule. The plains are hot and arid, true deserts, which can only be reclaimed by irrigation from the streams fed by the snows of the uplands. In every mountain region the amount of rainfall, up to a certain height at least, increases with the elevation. Where lofty mountains rise out of low desert plains the effect is especially marked, because, though the absolute increase in precipitation may not exceed that in more humid climates, the relative increase is vastly greater; and the effect on vegetation can be very plainly detected. As one ascends the south-west slope of the Tian Shan, the rainfall, as measured by the amount of plant life, increases steadily until at heights of from 9000 to 10,000


Sketch map showing
ELLSWORTH HUNTINGTONS ROUTES
in
CENTRAL ASIA
Statute Miles
Nat. Scale 1:5,000,000 or 79 miles = 1 inch
Routes
Railways
RUSSIA
TURKESTAN
CHINESE
TURKESTAN
BOKHARA
PAMIRS
Tashkent
Khokan
New Margelan
Osh
Andijan
Kashgar
Yangi Hissar
Yarkand
Issik Kul
Merke
Pishpek
Tokmak
Przevalsk
Prejevalsk
Semenof
Susamir Pass
Narin
Kuldja
Kuldja Range
Chatkal R.
Kassan
Namangan
Angren R.
Chust
Urutak
Sir Daria
Ferghana
Mirza-rabat
Khojent
Margelan
Kara Daria
Ura Tube
Zaraf-shan R.
Kara Kul
Mt. Kaufmann
Alai
Alai plateau
Sarikh Alai
Childara
Khanga R.
Kara Kul
Chatir Kul
Tengri Pass
Kashgar R.
Yangi Shahr
Tarim Basin
Yarkand R.
Shor Kul
Petauin
Maral bashi
Aksu
Kuruk Tagh
Kuruk Range
Kuruk Daria
Kuruk Kul
Kuruk Pass
Kuberganti P.
Kuberganti R.
Kara Kul
Narin R.
Narin Pass
Atbash R.
Atbash
Kara Daria
Kara Kul
Kuramaldi
Kuramaldi P.
Tash Kurgan
Tash Kurgan R.
Yarkand R.
Yangi Hissar
Yarkand
Kashgar
Yangi Shahr
Tarim Basin
Yarkand R.
Shor Kul
Petauin
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Kuruk Kul
Kuruk Pass
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Atbash
Kara Daria
Kara Kul
Kuramaldi
Kuramaldi P.
Tash Kurgan
Tash Kurgan R.
Yarkand R.
Yangi Hissar
Yarkand

feet one enters a region of most luxuriant vegetation. During early July, the time of our visit, rain fell nearly every day on the mountain summits and on the western slopes, and the ground almost steamed under the hot summer sun. Throughout the whole summer, in the region farther east, storms continued to be frequent at high elevations. At heights of over 12,000 feet practically all of the precipitation took the form of snow, and very frequently, even during the hottest season, there were hard frosts at night down to an elevation of 10,000 feet.

Even more marked than the contrast between dry plains and well-watered mountains was the change which our party experienced one day in early July, when passing from the south-western to the north-eastern side of the Kugart range between Andijan and Son Kul. In the morning we traversed a region where rain falls almost daily. The ground was covered with lush verdure, or with the greatest variety of flowers. The cool damp air, the flying clouds, and the frequent showers made it seem like a day in early May. A few hours later, on the other side of the mountains, we were in a barren country where the roads were thick with dust, the grass was meagre and poor, no flowers remained save shrivelled irises, and many hillsides were quite naked. Slopes which are exposed to moisture-laden winds from the west or north are well watered, while those that face in the other direction, or are cut off from the winds by other mountains, are sadly arid.

Between the northern slope of the main Tian Shan plateau toward Issik Kul and the southern slope toward the Kashgar or Tarim basin the contrast is even greater, although not so sudden. The northern slope is green and soft from top to bottom, the valleys are deep glades full of a rich growth of succulent herbs, the sides of the valleys are often dense with rose and barberry bushes, and the main mountain slopes are either covered with smoothly swelling green sod, or are set with a splendid growth of spruces. On the plateau-top the verdure continues in the form of thick grass. The south slope, however, facing the great inner desert, though scantily green with grass and bushes above an elevation of 10,000 feet, is woefully barren in its lower portions. Ragged slopes of naked rock are separated from one another by broad torrent beds of burning gravel. Not infrequently this south slope is impressive simply by reason of its ugliness and dreariness.

Before we leave the subject of climate, one more related effect deserves to be noticed. In the first example given above, that of the contrast between the two sides of the Kugart range, the effect on plant life is due almost wholly to the prevalence of certain winds and the condensation of water-vapour in air that is rising and hence cooling. In the second example, the difference between the vegetation of the two slopes of the main plateau, although due largely to the same cause, is in part attributable to the fact that in the northern hemisphere south slopes receive much more sunshine than do north slopes. Hence they

are drier in summer, a condition unfavourable to vegetation, and in winter are subject to much more frequent freezing and thawing, which tend to cause rapid weathering and erosion, with steepening of the slopes, another set of conditions unfavourable to vegetation. In many parts of the Tian Shan a marked contrast is thus produced between north and south slopes only a few hundred feet apart. Just to the east of the crest of the Kugart range in the locality already mentioned, the northern hillsides slope gently, and are well protected by a green growth of thick sage and less abundant grass, while the southern slopes are much steeper, and show only the red-brown and grey of the naked rocks.

JUKUCHAK VALLEY, ON THE NORTHERN SLOPE OF THE TIAN SHAN PLATEAU, AT THE LOWER LIMIT OF ANCIENT GLACIATION.

The strata are nearly horizontal, and have little or no influence in producing this result.

The Plateau Character of the Tian Shan.—Turning now from external effects, those due to the influence of the sun on the atmosphere of our rotating globe, we come to those that are internal and are due to the Earth's character as a cooling, and hence contracting, solid. In physiographic terms, the Tian Shan plateau may be described as a peneplain which has been highly uplifted and warped, and is now in a state of extreme youth. Long ago the closely folded Palæozoic limestones and slates which form the main mass of the plateau were worn to a peneplain not greatly elevated above sea-level. This was warped into broad shallow basins, and in these were deposited late Mesozoic and

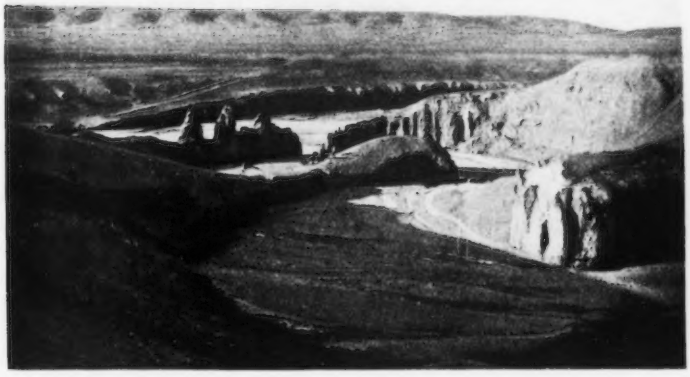
Tertiary strata, mostly soft sandstones and shales. Warping still went on, though very slowly, and on the edges of the basins the new strata were bent upward and were removed from the region of deposition. Then, as the process of erosion and base-levelling still proceeded, the old tilted limestones and shales, and the slightly tilted edges of soft new strata that lay against them, were all once more worn down, so that their surface formed a second peneplain almost at the level of the floors of the basins. In late Tertiary times this last peneplain was slowly uplifted to a great height, until to-day the central portion south of Issik Kul stands at an average elevation of about 12,000 feet. Coincident with the uplifting there was a warping, by which the old basins were again intensified. Since that time erosion has had but little effect in altering the country from the state to which it was brought by the uplifting and warping of the old peneplain.

The result of these geological changes is that, although the *internal structure* of the Tian Shan region is highly mountainous, its *external appearance*, or, in other words, its geographical aspect, is that of a plateau. South of Lake Issik Kul, where the plateau is most characteristically developed, there is a steep rise of 9000 feet from the lake-level to an even-topped ridge about 14,000 feet above the sea. This northern slope is the most beautiful part of the whole plateau. The green and partly wooded slopes that have been already described rise steeply to a cap of perpetual snow, where small glaciers descend one or two thousand feet. Below the glaciers the valleys are fine young gorges with precipitous naked sides rising to a height of several hundred or a thousand feet, and contrasting finely with the smoother slopes of the main mountain-side. Toward the west, where the plateau is less perfectly developed and the topography is more mature, some of the streams are deflected to east-and-west courses, by reason of faults apparently. Toward the east the streams of this northern slope are true consequents, having the form of short steep torrents which flow northward straight down the slope from the edge of the plateau to the lake.

The main mass of the plateau south of Issik Kul reaches a width of nearly 150 miles. It consists of broad shallow basins running east and west in *en echelon* pattern, and lying at an elevation of about 10,000 feet. Between them and bordering them run from five to seven ridges as broad as the basins, and rising by gentle slopes to heights of from 13,000 to 16,000 feet. Striking scenery is rare, for in spite of the great altitude of the mountains, the subdued outlines of the ancient peneplain still dominate the landscape. The treeless basins present monotonous green expanses, some of them, like the Ak Sai basin, 10 or 12 miles wide and 40 or 50 long, while another, that of Chatir Kul, is occupied by a small lake.

The ridges rise by long gentle slopes to flat summits, where often for many miles the sky-line is an almost straight crest from which the

rounded slopes of pure white snowfields descend gradually toward the basins. Here and there the crest-line is notched by high passes, the lowest of which are but 1000 or 2000 feet below the top of the ridge. Oftener the summit of the ridge is broken into individual mountains, broadly flat-topped and of nearly equal height. From between these mountains descend numerous small glaciers, which are so numerous that in the Yak Tash basin, the first to the south of the east end of Issik Kul, I counted twelve in sight at one time, while others that were invisible could be located by the glacial form of their valleys.



A SCENE IN THE AK SAI BASIN EAST OF CHATAR KUL, AT AN ELEVATION OF ABOUT 11,000 FEET. A MEANDERING STREAM HAS INCISED A NARROW VALLEY IN THE OLD PENEPLAIN. COMING FROM THE LOWER RIGHT-HAND CORNER OF THE PICTURE, IT PASSES THROUGH THE STRIKING GATEWAY OF TERTIARY RED SANDSTONE WHERE THE HORSEMEN ARE SEEN, AND JOINS THE MAIN STREAM, WHICH FLOWS FROM RIGHT TO LEFT.

This form is one of the most characteristic features of the Tian Shan plateau. On the side of a ridge in the smooth slope of an otherwise undissected portion of the old peneplain, subparallel, broadly U-shaped grooves begin near the top and deepen gradually downward until they assume the usual steep-sided, flat-bottomed form which is commonly associated with glaciers. The form is such as would be produced if the ridges were made of wax, and grooves were dug in them with an immense sugar-scoop, which was pushed deeper and deeper as it passed from top to bottom.

Before leaving the subject of the ridges one further type deserves

notice. In certain places, notably south-east of Son Kul, snow-covered portions of the old peneplain have been left isolated, and stand as flat-topped or rolling plateau masses 5 or 10 miles in diameter. On almost every side these crinkly edged plateaus are cut off from the surrounding basins by precipitous slopes of naked rock 2000 or 3000 feet high. Either there was faulting along their edges, or the bending was so steep as to give tremendous opportunity for erosion.

Returning now to the main mass of the plateau south of Issik Kul, we find that the streams, which seem for the most part to be consequent, flow but little below the level of the plains, and are characterized by immense gravel flood-plains, sometimes a mile in width. It is when the streams are obliged to break through the ridges in order to pass from one basin to another that the best river scenery is developed. In coming southward from the Kara Sai basin in the centre of the plateau, one rises by gentle slopes over old moraines to Chakir Korum pass, 13,000 feet high. From there it is necessary to descend into the valley that the Kara Kul, a westward-flowing affluent of the Narin Su, has cut in its passage from one basin to the next. Straight below the pass lies a magnificent tributary gorge, reached by a fearful road. For 900 feet our horses stumbled and slipped down a slope of angular limestone fragments, a slope that seemed almost perpendicular, although measurement showed it to be only 35°. At the bottom a flood plain 200 or 300 feet wide lay in the noon shade of lofty walls which in places were actually perpendicular. Lower down the brook flowed unconcernedly under the rubbish of a transverse embankment 200 feet high, the moraine of a little glacier, which from high up on the mountain-side continually poured its angular detritus into the valley, blocking it completely.

Not far below this moraine one enters the main valley of the Kara Kul, a magnificent gorge cut into the solid mountains to a depth of 2000 feet. At the bottom the gorge was once partly filled with gravel, which at a later time was dissected into terraces. On these terraces in certain places lie old moraines, a subject to which we shall shortly return. To the southward the comparatively easy way out of the Kara Kul gorge leads up an open valley to Kubergenti pass, nearly 13,000 feet high, beyond which lies the Mudirum basin, a barren waste of almost naked soil, so high and cold that vegetation has no opportunity to grow during the month or two when the snow is gone. Here and there over its broad surface, and even up to and over Kubergenti pass, lie great granite boulders, left by the glacier that once filled the valley to a width of 5 or 6 miles. Further downstream to the west, where the snow does not lie so late, the basin and the pitted moraines which fill it are green with fine soft grass, and bright with flowers.

Still to the south of the Mudirum basin one sees the range of Kok Tau on the Chinese border, the loftiest and most picturesque of the

Tian Shan ranges. Here the mountains rise to a height of 16,000 feet, and are high enough so that even in the relatively short time since their upheaval they have been carved into forms that are truly alpine. Below the snow-line large glaciers stretch out their moraine-covered tongues from immense U-shaped valleys, while at greater heights the summits of the range have been carved into sharp-edged triangular matterhorns.

In form, at least, the scenery of the southern border of the plateau is more striking than that of the northern portions. Owing to the steeper

A GLACIAL LAKE, ELEVATION OVER 11,000 FEET, IN THE YAK TASH BASIN, JUST SOUTH OF JUKUCHAK PASS. AT BOTH ENDS OF THE LAKE ARE OLD MORAINES. IN THE BACKGROUND RISES ONE OF THE CENTRAL RANGES OF TIAN SHAN.

slope and to the greater extremes of temperature, erosion has been more rapid than elsewhere, and as a result, the valleys are deeper and the peaks sharper. As one crosses Batmanak pass, 40 miles north-west of Shor Kul, and from its 13,000 feet of height looks eastward into China, the view is utterly different from the smooth-featured scenery that has gone before. Huge waves, a score of them, rise higher and higher in the distance, each wave a sharp inaccessible ridge or pointed peak white with new snow on the north side, brown on the other. Further south-west near Shor Kul, the foothills, though buried deep in naked gravel, are still sharp and bristling, and the valleys are barren gorges which assume the most gorgeous red, pink, and yellow colouring where the streams cut through the soft Tertiary deposits of the Tarim basin.

The Alai Region.

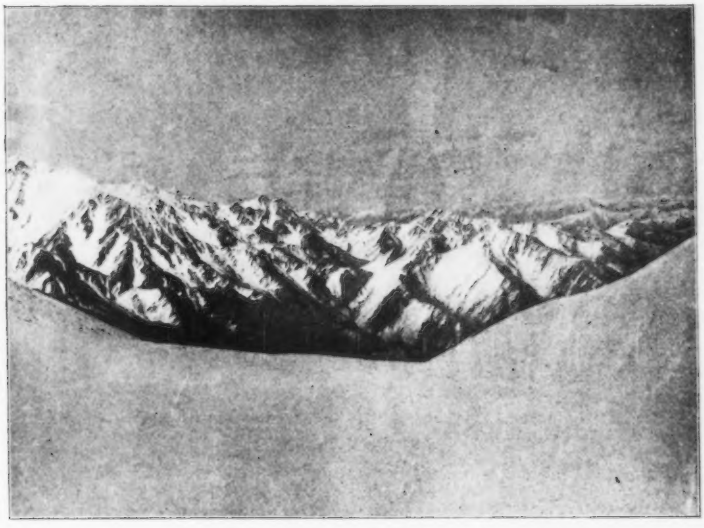
The Alai and Terek ranges differ so little from the Tian Shan that but a paragraph will be devoted to them. Each is essentially a great ridge of uplifted peneplain, like the Tian Shan plateau, except that while the latter is a great fold diversified by minor folds forming basins, the Alai and Terek are each a simple arch. On account of its proximity to the loftier Pamirs, and its east-and-west direction, the Alai range presents no marked difference of climate between its two sides, but the Terek range shows the same contrast as the Tian Shan between its well-watered western slope and its dry eastern slope toward the Tarim basin. On the Ferghana side both ranges show the gentle slope of what seems to be the old peneplain bevelling tilted strata belonging both to the old Palæozoic series of metamorphic limestones and to the newer Mesozoic-Tertiary series of softer rocks. Practically all the streams are consequent. In the harder rocks they have cut striking gorges, some of them 1000 feet deep and so narrow that the water flows between walls of solid rock. Where the softer strata prevail, the old peneplain surface is largely destroyed, the valleys widen greatly, and terraces, which have been fragmentary in the narrower portions of the valleys, become well developed. On the eastern side of the Terek range, and on the southern side of the Alai range north of the great Alai basin, the old peneplain is almost wholly destroyed, because of the softness of certain strata and the steep slope given by recent earth-movements.

Glaciation.

In the preceding sections glaciation has been often referred to. As I have discussed this subject at some length in another place, I shall here merely review the main conclusions. Throughout all the high mountains of Turkestan glaciers are numerous at elevations of over 12,000 feet. The great majority are small, not over a mile in length, and come to an end close to the mouths of their cirques, and even the largest seen, that of Kok Su or Khoja Ishkhen in the Alai mountains near the boundary of Bukhara, reached a length of scarcely 5 miles. In ancient times, however, as is amply shown by old moraines and abandoned glacial valleys, glaciation was much more extensive than to-day, and certain glaciers, such as those of Khoja Ishkhen, Yak Tash, Mudirum, and others, reached lengths of 20, 30, and even 50 miles.

In all the larger valleys there is evidence that in ancient times moraines were deposited successively in several different places, each farther up the valley than its predecessor. One of the best examples of this is at the head of the Jukuchak valley, which descends northward for about 20 miles from the northern edge of the Tian Shan plateau to the eastern end of Issik Kul. At an elevation of about 8600 feet, as one

ascends the valley, there is a sudden change from a V-shaped gorge, narrow and steep sided, to a U-shaped valley, open and round bottomed, which is filled with a deposit of large boulders and other glacial material. There seems to be little doubt that this latter is an old moraine, although all traces of morainic topography have disappeared. Above this for a space the valley is open and unencumbered, except for a little gravel that has been laid down by the stream itself. Then comes a second moraine, smaller than the first, and apparently younger, as it shows the moraine topography. Next comes a second open space of a mile or two, which continues till a third still younger moraine



THE MOUNTAINS OF CHINESE TURKESTAN, LOOKING EASTWARD FROM BOTMANAK PASS, ON THE SOUTHERN BORDER OF THE TIAN SHAN PLATEAU. ELEVATION 13,000 FEET.

again blocks the valley. Still farther upstream a fourth and fifth moraine appear in the same way, and finally the present moraine comes in at a height of a little over 11,000 feet. Other instances of the same sort, such as the Khoja Ishkhen and Mudirum moraines might be cited if space allowed. All of them seem to show that during the glacial period, here, as in Europe and America, there were several epochs, probably five, each less intense than its predecessor.

Having come to this conclusion, the question at once arises, Were these glacial epochs separated by warm interglacial epochs, or do the moraines merely mark successive stages in a single intermittent retreat? Moraines like those instanced above indicate nothing as to this point.

The lower ones are clearly decidedly older than the upper, but in either case that would be true. Other moraines, however, seem to indicate that the hypothesis of cold glacial epochs alternating with warm interglacial epochs is the true one. On half of the more than twenty cases that I saw, the younger moraine does not lie upstream from an older one, but at approximately the same level inside the remnants of its predecessor. The only explanation of this seems to be that after the oldest glacier had filled the valley with moraine stuff at a certain point, it withdrew, and the stream from its foot flowed through the moraine and cut in it a trench. Into this in course of time the glacier again advanced, and deposited a younger, smaller moraine inside the first one, which latter remained as a terrace on either hand. The point to which the ice withdrew must have been at least as far upstream as the head of the terrace, and this, in some cases, is close to the moraine that is now forming or even above it. In the case of the Taka valley on the south side of the Alai basin, four such glacial terraces can be seen, indicating five advances of the ice. These facts, and many others which must perforce be omitted, seem to justify us in concluding that in Turkestan the glacial period consisted of five decreasingly severe epochs of ice-advance separated by interglacial epochs of ice-retreat, during which the climate was as warm or warmer than to-day.

Terraces and their Relation to the Glacial Period.—More important than the old moraines are the terraces which form an almost universal feature of the valleys of Turkestan. They are best developed along the middle courses of the streams, but are often found from end to end. Occasionally there is only one terrace, but usually there are more, and where they are best developed the number amounts to five or six. They are found along streams of every size, and along those that flow in every direction, whether it be to lake, river, or desert. On a given stream they are very persistent, disappearing in narrow gorges, but reappearing as soon as the valley widens. Along some streams each terrace is cut partly in gravel and partly in rock, while along others they are cut wholly in gravel which fills the valley bottom. In either case it seems clear that there have been repeated, though diminishing, oscillations between two sets of conditions. Under the first the streams cut straight downward without materially widening their valleys; under the second they stopped cutting downward, and either cut sidewise as in the case of the terraces cut in stone, or else went so far as to fill their valleys in the cases where the terraces are cut in gravel. Phenomena of such remarkable uniformity over an immense area and involving such systematic and delicately balanced oscillations from one set of conditions to another can hardly be explained by any hypothesis of tectonic movements. The only other cause competent to produce such effects seems to be climatic change, and so far as I can see, such an hypothesis seems to fit all the facts. During a time of moist, cool

climate, when rain fell often, when vegetation was abundant and weathering was rapid, the streams would be large and very heavily loaded, but would not be liable to floods. Accordingly they would broaden their beds and deposit gravel. When, on the other hand, the climate was warm and dry, weathering would be slow and vegetation would be scarce. Floods would be the rule, and the streams would tend to cut rapidly downward. If times of increased cold and rainfall, such as the glacial epochs shown by the old moraines, alternated with times of warmth and aridity such as interglacial epochs, and if the intensity of conditions decreased from epoch to epoch, the effect would be to form

BRIDGE OVER THE KOK SU, JUST EAST OF TEREK PASS, ON THE HIGH-ROAD FROM KASHGAR TO FERGHANA.

terraces such as those that we have described. That the terraces and the old moraines were in process of formation at the same time is shown by the relation in which they stand to one another. Along the Kara Kul river in the centre of the Tian Shan plateau, certain moraines of middle age lie on the upper or older terraces, while the younger terraces have been cut in or below the material of the moraines. In view of all the facts regarding moraines and terraces, we are led to the conclusion that both are due to the same cause. That cause seems to be the glacial period, which must have consisted of at least five epochs of increased precipitation, alternating with interglacial epochs when the climate was similar to that of to-day. The effect of these alternations of

climate is the last touch that has brought the uplifted peneplain of Turkestan to the condition in which we see it to-day.

Ontographic Relations.

In the preceding part of this paper attention has been confined almost exclusively to the physiographic side of geography. In the remaining portion I shall try to show the relation of a few of the inanimate facts of physiography to the animate facts of ontography. Even a most cursory examination of the life of any region shows that the lower forms support the higher; animal life is absolutely dependent on plant life. Therefore the conditions which are most effective in determining the distribution and character of plants are indirectly the most effective in determining the distribution and character of animals, and finally of man. Soil, water, and sunshine are the factors on which plants chiefly depend, but the three are of very unequal importance. If conditions of either water or sunshine are unfavourable, plants will not flourish no matter how good the soil may be, while if these conditions are favourable plants will flourish in even the poorest soil. To a certain extent the distribution of water and sunshine depends on surface forms, such as valleys, basins, hills, mountains, and northern or southern exposures, but in the main they are an expression of climate. Thus it comes to pass that climate is by far the most important element in determining the distribution of plants, and hence of animals and men. So universally is this recognized that we appeal continually to the character of vegetation as an evidence of the climate of a region.

Vegetation.—As has already been said, the climate of the high mountains of Turkestan is such that in most places vegetation is abundant and rich. For some reason trees are very rare except in the valley bottoms and in certain areas on the northern slopes of the Tian Shan and Alai. What few exist are largely spruces and cedars, with some poplars and birches. Grass abounds almost everywhere, and often possesses the soft, thick, luxuriant greenness that is characteristic of English scenery. In the Kugart valley, at a height of 3500 feet on the south-west slope of the Tian Shan, grass and weeds had grown to such a height by the end of June that in walking through them one found the view obstructed. Here, as in most places where agriculture is practised among the mountains, wheat was growing with but little irrigation, and could be grown with none at all. Farther up the same Kugart stream, at heights of 6000 feet and over, the valley sides were covered with a smooth growth of short grass, while among the rocks and in the valley-bottom assafœtida and other big-leaved succulent weeds were interspersed with roses, purple columbines, and a few poplar trees. A day's ride farther to the north-east, on the terraced valley sides beyond the pass at the head of the Kugart stream, the flowers were even more

beautiful and varied. The majority closely resemble those that grow at home, except for differences in colour. The large geranium is blue; the roses at this season, the first of July, are generally yellow, though some are white; the poppy is lemon-yellow; the bluebell is of a very delicate pale colour; the spherical heads of the wild onion are crowded with flowers of an intense lilac hue; and the unripe barberries are deep purple. Among the flowers scattered along the roadside none fitted its

THE TEREK VALLEY, JUST WEST OF THE TEREK PASS, ON THE HIGH-ROAD FROM KASHGAR TO FERGHANA.

surroundings better than the usually obtrusive peonies, spots of deep rich red, almost hidden among thick green leaves of many shades. Farther down the same valley the broad grassy plain of a terrace was tinted blue with gentians—not the fringed variety, but the sweet-scented kind that opens in spring with us.

Dozens of other flowers make the gentle slopes of the grassy mountains wonderfully attractive. Around Son Kul during the second week in July, just after the melting of a foot of fresh snow, the newly

sprouting grass at a height of 10,000 feet was exuberant with spring flowers—buttercups, violets, innocence, edelweiss, splendid irises, purple phlox, large orange cowslips, delicate sweet-scented daisies with lavender petals and yellow centres, and many others whose names I do not know. A week later, on the northern slope of the Tian Shan plateau south of the western end of Issik Kul, rhubarb and alpine candytuft were the rule. The effect of differences of soil in altering the character of vegetation was here well brought out on an old moraine half buried in a green flood-plain. From a distance the outline of the moraine was clearly distinguishable by reason of its bluish-grey colour; nearer at hand the moraine looked even bluer. It proved to be completely covered with forget-me-nots, while not a single flower of this kind grew in the green plain. Farther east on this same northern slope of the plateau, at a height of from 10,000 to 11,000 feet, many old moraines were studded not only with yellow poppies, but with pansies and with the small flowers of the same genus whose old-fashioned name is "ladies' delight." There were purple and yellow varieties of both species, and in both there was a good deal of variation, just as there is among cultivated varieties. So numerous were the pansies, that on one old moraine I sat down to see how many I could pick without moving from my seat. I gathered seventy-four, mostly purple.

Although flowers are exceedingly abundant on the slopes of the mountains, they are relatively rare on the main upland of the Tian Shan itself. There the vegetation is chiefly grass, with a scattering of small Alpine flowerets. Among the plants of this high altitude the most unusual is a short bunchy thistle looking like a cylindrical cactus, 1 foot high and 5 inches thick. Our dog looked very sheepish as he turned back from a headlong run, on discovering that the first one which we encountered was not a marmot sitting before its hole.

In this consideration of the vegetation of the mountains of Turkestan, I have said little of the plants that are of use in agriculture, for the simple reason that this art is scarcely practised, except in a few of the lower valleys. Fruits, too, and berries are rare. At an elevation of from 6000 to 7000 feet in the Kichik Alai valley south of Osh, I found in one place a number of wild fruits, such as apricots, slightly astringent, but still agreeable; plums, a little red variety no bigger than a cherry, and growing on scraggy bushes 5 or 6 feet high; "chichirkanak," a fine-leaved olive, with very small and acid golden fruit that cannot be eaten; and "dolona," a pretty tree closely related to the apple, and bearing racemes of a pulpy golden yellow or reddish fruit the size of a small cherry.

On the whole, the most interesting features of the vegetation of these mountains in the heart of Asia are—first, the sudden contrasts which were described in the section on climate; second, the absence of trees, due in part perhaps to the high elevation; third, the great

amount of grass; fourth, the great variety and beauty of the flowers; and, lastly, the great number of plants that are known to the civilized world as garden products, but here grow wild. At the risk of repetition, I will give a list of the plants, which I happened to record, that grow wild in the Tian Shan and Alai mountains, but are cultivated in Europe and America. These comprise the apple, apricot, asparagus, candy-tuft, and chrysanthemum; the large blue and purple varieties of columbine; the crocus, heliotrope, olive, and onion; the pansy and ladies' delight, both purple and yellow; the peony, phlox, plum, and poppy, red and yellow; the rhubarb; the rose in red, yellow, and white varieties; and the tulip. That there are many more than these nineteen species I am well aware, but they are enough to show the general character.

Animal Life.—Animal life, aside from that which is dependent on man, is not abundant among the mountains of Turkestan. The plants of the temperate zone have adapted themselves to a climate that alternates between cold winters and warm summers, and have acquired the habit of suspending their life functions during the period of cold. Animals, however, especially those of the higher kinds, have learned this lesson but imperfectly. Insects overcome the difficulty in much the same way as plants, either, like annuals, dying in the fall and leaving their eggs to reproduce their kind, or, like perennials, becoming torpid in winter and recovering in the spring. Thanks to this habit, insects abound wherever plants abound to furnish them with food. At the eastern end of Issik Kul, where flowers are very abundant, man makes use of this fact to his own advantage, and great numbers of bees are kept. Reptiles, like some insects, have adopted the perennial habit, but notwithstanding this they are very rare in the high mountains of Central Turkestan. My notes contain no record of either turtles or snakes, and, so far as I can remember, the only reptiles were a few lizards at low altitudes.

Birds have adopted quite a different method of meeting the exigencies of seasonal changes of climate. Being able to migrate at will, they can come to a given region whenever conditions are favourable. Accordingly, in summer the lower slopes of the mountains are inhabited by birds of many kinds. At the end of June we found the Kugart valley full of meadow larks, and at a height of 5000 or 6000 feet the bushes and grass were alive with chattering flocks of rose starlings. In the very lofty regions of the main plateau, birds, as well as insects, are not particularly abundant, but such places as the shores of Issik Kul swarm with them.

Of all animals, mammals are least able to adapt themselves to severe seasonal changes and long winters. In the high mountains of Turkestan, a few, such as the mouflon, antelope, and argalleh, eke out a precarious existence by digging under the snow in winter. Others,

such as rabbits, live underground, and obtain a meagre winter sustenance by gnawing bark and buds. When herbivorous animals are so scarce, beasts of prey cannot be numerous. Only one, the wolf, is at all important, and he is so rare that during three months' travel I encountered but one. Aside from these animals, there is one mammal, the marmot, that is thoroughly adapted to his surroundings. He has acquired the habit of the perennial plants, and sleeps comfortably deep underground during cold weather, only coming out for a few months during the summer, when he quickly grows fat on the rich grass that surrounds his hole. Most of the marmots live at an elevation of from 9000 to 12,000 feet, where the grass is richest. Old moraines, being soft and easy to dig into, are a favourite resort. So numerous are these little animals, that one day in mid-July, as I rode slowly along on the Chinese border near Chatir Kul, I counted twenty-eight in twenty minutes. A month later in the Alai valley I counted thirty-five during half an hour. The abundance of this one animal, which is thoroughly adapted to its surroundings, shows how great might be the amount of animal life if the ground were not so long covered with snow.

(*To be continued.*)

THE PHYSICAL HISTORY OF THE VICTORIA FALLS.

By A. J. C. MOLYNEUX, F.G.S., F.R.G.S.

THE majesty of the Victoria falls is daily inspiring attempts at descriptive writing, and already, by the aid of the illustrated journals, photographs of some of the natural beauties of the chasm and cataracts are familiar. But of the causes and processes that have led to this wonder of a wondrous continent few, if any, writers have given an idea, and the theory of Dr. Livingstone—the discoverer of the falls—remains uncontroverted, nay, is repeated by each succeeding traveller who has described them, and is accepted by each visitor of to-day. Yet the general desire is for some more detailed explanation of the processes that have been used by nature in sculpturing these beetling precipices and deep chasms. In seeking such explanation many points must be considered. The imagination must recall pictures of the geography of Africa when great lakes filled the depressions of the plateau now occupied by the Chobe, Botletle, Ngami, and upper Zambezi, and reference must be made to the present-day conditions of the Zambezi river system.

The Zambezi River.—Running close to and parallel with the south and east coast of Africa is a mountain chain that, except in the cases of the Zambezi and Limpopo rivers, forms the watershed of the streams that flow to the Indian and Atlantic oceans. Eastward

of this elevated axis the coastal lands are narrow, and the rivers reach the sea by courses of from 200 to 300 miles, while, on the contrary, rivers draining the western slopes have to pursue long meanderings nearly across the whole continent before discharging into the Atlantic, such as the Orange and the Congo.

Geographers are of the opinion that, in earlier times, the waters now flowing into the Limpopo and Zambezi were collected in large lakes on the elevated central plateau lying between the Kalahari desert and the Barotse country, and thence made their way to the western ocean. Into this central "saucer" the rivers from the German territory to the north-west, the Zambezi to the north, and the Nata river from the Matabeleland plateau discharged themselves. Now, however, the mountainous backbone that runs along the east coast of South Africa is cut through, and the Zambezi and Limpopo rivers deliver their burdens to form the swampy and deltaic lands of the Portuguese east coast, while the central lakes are nearly dried up. Where this mountain backbone crosses Rhodesia it is formed of granites, gneiss, and schists, and impinging against it are the sedimentary rocks of the South African coal age. The Limpopo has eroded its course through this complex to a lower level than its northern compeer, and though held back at one time by similar geological features (the Tuli lava-sheets), it now passes its water rapidly out to the ocean, and its lower central parts take, in winter, the form of a sand river.

The Zambezi is still battling against the obstacles that seek to check its erosive action, and which divide it into three long reaches. The one impediment is that which causes the mighty cascade of the Victoria falls, 1000 miles from the coast, and the other is the series of rapids known as the Kebrabasa, 360 miles up. It is at the latter that the river passes by the gorge that it has gnawed in the elevated watershed, here reaching an altitude of 4000 feet, to the coastal plains beyond.

The deltaic regions of the river are naturally tame and uninteresting (2, p. 27),* with low and marshy banks 3 to 4 miles apart and many intervening islands; but at a distance of 260 miles from the coast the monotony ceases, and a range of hills crossing the river in a north-easterly direction has necessitated the natural erosion of the deep and narrow channel known as the Lupata gorge. Above this are the foothills of the mountain axis, the country becomes more hilly and picturesque, and more populated, while the currents of the river are stronger, until 100 miles further up we are confronted by the mountains in which lies the Kebrabasa gorge, forming the east flank of the South Central African plateau, 3000 to 4000 feet in altitude.

According to Livingstone's description (2, p. 36), the lofty range

* See references to literature at the end of the article.

of Kebrabasa country crosses the Zambezi and confines it within a rocky dell of a quarter of a mile in breadth, from which the slopes of the mountains rise precipitately for some 3000 feet. Mount Morumbwa, near the top of the gorge, with sides at an angle of 70 degrees and from 2000 to 3000 feet high, has pot-holes at 100 feet above the present low water. In the upper portions of Kebrabasa, ranges of lofty mountains stretch from the north-west. The chief rock is syenite, while the metamorphic rocks are contorted and thrown into every conceivable position. In the dry season the stream runs in a narrow and dark groove not more than 40 or 60 yards wide. The range is from 35 to 40 miles in breadth, the greater part of the river's course being broken by turbulent and dangerous rapids, but as the water rises 80 feet in the gorge in the floods, navigation will be possible for part of the year.

The latest map issued by the Chartered Company states that the total fall in this cañon is no more than 150 feet.

Above the gorge the river opens out on the Chikova plains, and assumes the same appearance as at Tete, with sedimentary rocks. Near by is the town of Zumbo, 550 miles from the coast, and not more than 800 feet above sea-level—an average fall, Kebrabasa included, of not more than 1·5 foot per mile.

The Middle Reach.—From the Kebrabasa to the lower end of the cañon of the Victoria falls, a span of 600 miles, may be called the central portion of the Zambezi. Parts of this are of great beauty, peaceful and enticing, fringed by a narrow belt of dark and shady trees, the banks cultivated in terraces by the lotus-eating natives, with waters teeming with fish, and which still afford undisturbed retreats for hippopotamus.

In places, however, the stream flows with a furious current through narrow and gloomy gorges, including the Kariba, formed by its passage through a range at the junction of the Sanyati. Dr. Livingstone, who made the passage down in a native canoe, claims the Kariba, as well as the Victoria falls, as the result of sudden fissuring. This portion below the falls has an average drop of 2·2 feet per mile.

The higher portions of the plateau circle round this central basin from the Kebrabasa range to form the upland country of Matabeleland to the south and the Tanganyika plateau to the north, with altitudes of 4000 feet, to join again at the Victoria falls. From these higher watersheds the tributary rivers fall rapidly and have eroded large basins in the coal-bearing rocks, separated from the Zambezi river by parallel ranges of hills, through which they pass in deep and narrow gorges.

The westward erosion of this central basin through which the Zambezi flows was checked by the thick sheet of volcanic rocks that underlie the Tertiary sandstones of the Batoka plateau. Over this stubborn and unyielding wall the Zambezi drops some 400 feet as

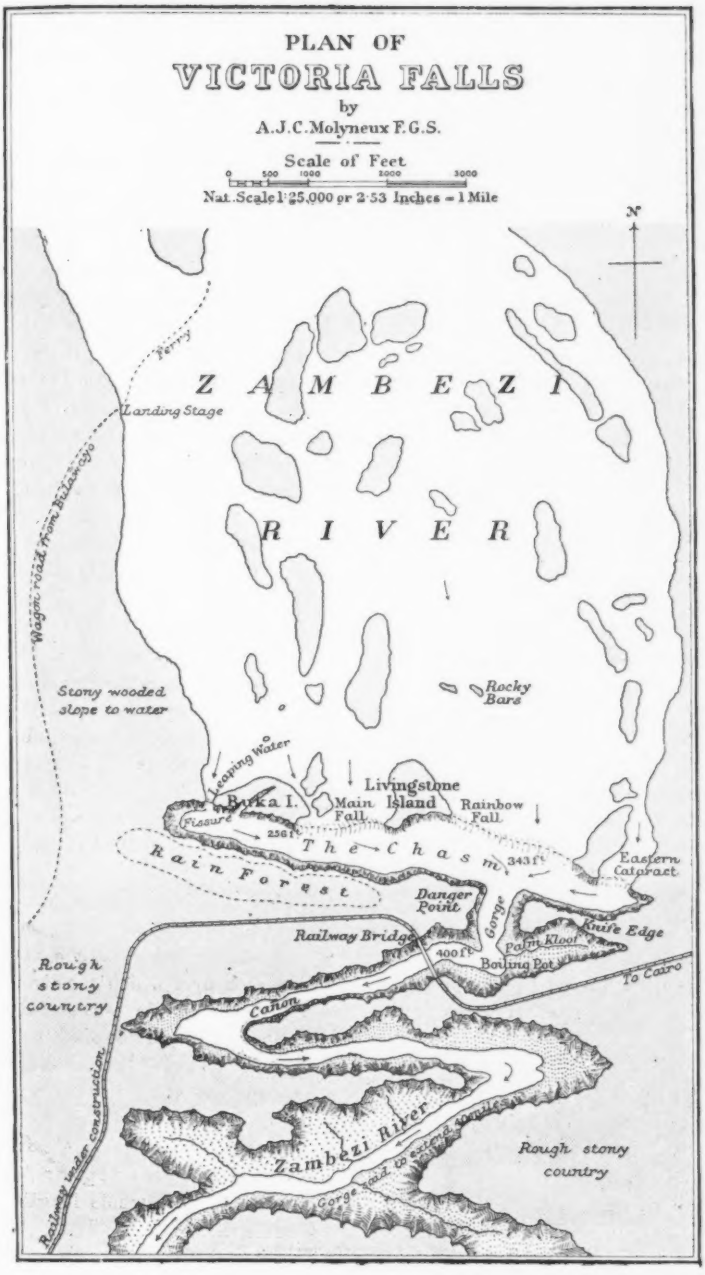


FIG. 1.—PLAN OF VICTORIA FALLS.

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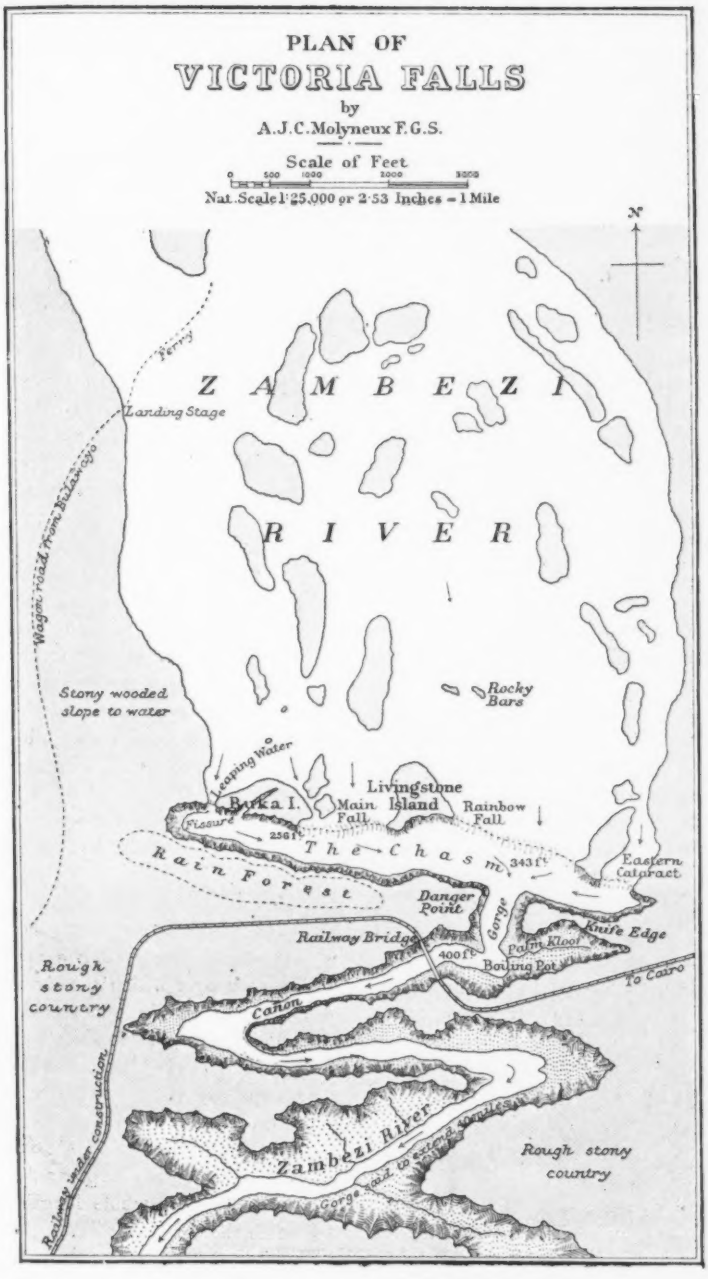

FIG. 1.—PLAN OF VICTORIA FALLS.

the Victoria falls, besides having a rapid descent of some hundreds of feet additional during its course through the 40 miles of the cañon. Between the central reaches and the level above the falls there is a difference of about 1000 feet.

The Upper Reaches.—From the falls to its sources, a distance of 800 miles, are the upper reaches of the Zambezi—a region of singular beauty, with navigable waters for the greater part of the distance. The country is open and undulating, and it might be said that the river runs along the very top of a plateau of 3500 feet in altitude, for the difference between the water-level and the surrounding country is very slight. The basalt sheet of the Victoria falls extends many leagues to the west, and the river, having eaten through the soft overlying sandstones, has reached the upper level of this sheet to then find that its deepening action is checked. But little lowering of its bed is therefore taking place, and until the cañon of the Victoria falls eats its way back to the western edge of the volcanic strata, the upper river must always be the wide, low-banked, and slow-moving stream it now is.

The Victoria Falls.—Livingstone, the discoverer of the Victoria falls, gained his first sight of them from an island in mid-stream on the actual edge of the chasm—a position from which no subsequent white man has gained his first impression. Seen from either bank of the river, the spectacle is majestic and awesome; but from this point, on a small island balanced as it were on the quivering precipice, the foam dashing on either side of him, the grey depths of the chasm beneath, and with the sunshine and rainbow and mist overhead, the view must have been infinitely weird and impressive. The discoverer, in describing the phenomenon, claims that "the falls are simply caused by a crack made in a hard basaltic rock from the right to the left bank of the Zambezi, and then prolonged from the left bank away through 30 or 40 miles of hills."

On his second visit, in 1860, with Dr. (now Sir John) Kirk and his brother, Charles Livingstone, a more careful investigation was made, but the same vigorous theory was maintained. It was admitted that Niagara has been formed by a wearing back of the rock over which the river falls, with a gradual recession through long ages, "but," it was stated, "the Victoria falls have been formed by a crack right across the river in the hard black basaltic rock which then formed the bed of the Zambezi. The lips of the crack are still quite sharp, and are about 3 feet from the edge. . . . The walls go sheer down without any projecting crag. . . . When the mighty rift occurred, no change of level took place in the two parts of the bed, consequently the water suddenly disappears." The zigzag course of the gorge below the falls and the whole length of the grand cañon is accounted for on the same theory.

The Livingstonian hypothesis was accepted by each subsequent

Photo by Pelcotti, Bulawayo (Copyright).

FIG. 2. **VIEW ON THE ZAMBEZI, LOOKING DOWN STREAM TOWARDS THE FALLS.**

Showing the spray-cloud rising from the chasm.

Photo by Pedratti, Bulawayo (Copyright).

FIG. 3. **VIEW ON THE ZAMBEZI, ABOVE THE FALLS.**

traveller. Thomas Baines and James Chapman saw the falls in July, 1862, and refer to no other theory. Edward Mohr (7, p. 320) visited them in June, 1870, and the lateral chasms suggested to him the thought "that awful convulsions of the Earth's crust must once have taken place here to produce such results." Selous (5) attributes the vent to some convulsions of nature, and no later writers suggest any other causes.

Livingstone had such an understanding of the natural features of South Africa, and sketched the broad geological and geographical problems with such a skilful hand, that it is with great diffidence that I suggest, in this particular case, other causes than the sudden rending of the Earth to account for the phenomenon of the Victoria falls. Yet I hold the firm conviction that here, no less than at Niagara, the combination of cañon, gorge, chasm, and falls is due to the ever-reducing action of moving water, eating back with relentness energy, year by year and age after age, into the hard and stubborn wall of igneous rock.

For those who desire to read poetical impressions of the falls, reference need only be made to the early descriptions of Dr. Livingstone, in his first book (1), and the collaborated results of his second visit (2); to those of Thomas Baines (3), of James Chapman (4), or to the later word-pictures of Mr. E. F. Knight. But for the purposes of this paper the phenomenon must be described, not so much as an object of beauty as with regard to features that must be later called in evidence for geological investigation.

Before giving a short description of the falls, it is very desirable that some caution should be used in selecting names for the different features, and, if possible, the early nomenclature, where suitable, should be restored and perpetuated. Some of the names already allotted by visitors are particularly unsympathetic or inappropriate. "Devil's cataract" and "Devil's island" are fast becoming the accepted names of the foaming western cataract, again exemplifying that inexplicable sentiment which invokes the devil's sponsorship for beautiful features in all parts of the world. Baines called this "The Leaping Water," surely a more pleasing term, and the island became known to him as "The Three-rill'd cliff." For this latter, "Boaruka island," the native designation (according to Livingstone), is more appropriate. "Danger point" for the rock overlooking the exit from the chasm is descriptive; but "Lovers' walk" for the glorious Palm kloof is too forbidding, especially as no "lovers" had been known to have put in an appearance at the falls, and the term can have been only anticipatory. "Palm grove" or "kloof" is becoming more used, and I submit that the South African word "kloof" is more applicable.

In this paper I shall apply names as follows: "The Chasm," is the cleft into which the river falls; "The Gorge" (that is, the *throat*), is the exit as far as the "Boiling Pot;" and then the "Grand Cañon' commences and extends for 40 miles.

Geology.—During a late phase in the geology of the country, which is probably referable to the Tertiary period, South Central Africa was subject to vigorous volcanic action, the concrete forms of which can now be seen in the denuded and exposed areas of lava-flows existing in the Limpopo and Zambezi valleys.

One basalt sheet lies between Wankies coalfield and the falls, and will be noticed when travelling on the railway. It is coincident with the country at one time owned by the Bakota tribe, a race of industrious iron-workers, and recently almost decimated by the raiding Matabele in Lobengula's days. This volcanic outflow might well be known as the Batoka basalt. The igneous sheet is seen in the cañon to occur in alternating flows of compact and of highly cellular and amygdaloidal basalts. In many other localities the basalt is interbedded with the soft forest sandstones, but in the falls district the overlying stratum has been eaten into by the Zambezi and the tributary streams, until the basalt sheet has been reached, and now all the rivers of the district flow over hard igneous beds, while the upper strata of soft sandstones form gentle slopes and afford a hospitable soil for the graceful forest trees that clothe them. This alternation of rocky valleys with only stunted and shabby trees, and the luxuriant growths of the higher sandy slopes, is a distinctive feature on the railway, and is repeated along the Zambezi valley. These beds of hard rock and buff and red sand extend far to the west. At the confluence of the Linyante, some 50 miles above the falls, Livingstone describes an island named Mparia, which is composed of "trap containing crystals of quartz encrusted with green copper ore (amygdaloids?) (1, p. 339); while the Gonye falls, 120 miles still further north-west, are stated to occur in a deep fissure in sandstone, 100 yards wide and several miles long (1, p. 167), the bed, according to other travellers, being formed by masses of basaltic rock.

The Falls in Detail.—Rising at a distance of 1900 miles from the east coast, joined by the Lungwebungu river that has its source within 400 miles of the western ocean, augmented by the water soaking from the "sponges" of the distant Barotse valley and the outfall from the swamps and wide lagoons of the Linyante river, the Zambezi, long before it reaches its purgatory of the falls, is a noble and expansive river, flowing in a wide valley, bounded by the distant and low hills of red and forest-clothed sand. For many miles above the cataract its bed is the level igneous sheet above described; its blue water is dotted with verdant islands of the same rock; and where rapids occur, it is the same hard basalt that impedes its course, and over which the waters churn and boil.

Below the old site of Sekota's kraal the river is at its widest, the islands are most numerous, and the water is most in repose. Sailing down this most beautiful reach, there is no evidence except the

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FIG. 4. **VIEW LOOKING INTO CHASM FROM ITS WESTERN END.**

The "leaping water" is on the left, Boaruka Island with its new rift cascade is in the centre, and the cliff to the right is crowned by rain forest. The illustration also shows the rainbow, the columnar cleavage of the rock, and débris of the cliffs.

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FIG. 5. **THE GRAND FALLS.**

At high river this is one expanse of falling water, but now separated into numerous cascades in the crevices of the rock. Note the continuance of the river level to the very edge of the falls.

distant gossamer veil of rising spray (Figs. 1 and 2) to show that the river does aught else than pursue a quiet course. But beneath the pillar of spray is the chasm put like a snare across the river's path to trip it into the pitfall below. There is no lack of evidence to show that the ancient course, before it had bitten deep into the earth, was along the higher level of the lava-sheet. At the confluence with the Mlamba, just above the first rapids, is a wide expanse of river alluvium, with the banks of the smaller stream 10 or 15 feet above its present level, showing gravel with basalt pebbles, and in the converging valleys of the Makone, and other watercourses above the falls, there are beds of tufa containing fluviatile shells. Also I have found shingle of water-worn agates from the amygdaloidal basalt at a distance of 15 miles from the cataract, at an even higher level than the Zambezi now occupies above the falls. Livingstone found other evidence of high-level river terraces lying some 200 feet above the Zambezi at the falls (1, p. 945), and considered it as showing that the whole country between the Lekone and the Libebe in the west was formerly one fresh-water lake, drained by the sudden fissuring of the basalt sheet. The small altitude of the plateau above the river supports the idea of the inland sea, for, as I have said, the river seems to run along an almost level surface on the top of the Barotse plateau.

The chasm across the river (taking the measurements ascertained on Livingstone's second visit) is little more than 1860 yards long—the same as the breadth of the river—that number being fixed upon as indicating the year in which the falls were first carefully observed. The lip of the falls is subdivided by natural features as follows:—

Nearest to the right bank is the misnamed "Devil's cataract" (Leaping Water of Baines), 36 yards wide (2, p. 152)—a sloping mill-race that carries much water when many other portions are dry at low water. Next comes the island of Boaruka, about 200 yards wide, cut by a stream and fissure through which water pours at flood times (Fig. 4); then comes the great fall 573 yards broad divided from a second fall of 325 yards by a projecting rock. At the east end of this fall is Garden island, now known as Livingstone island, lying on the very edge of the precipice some 1170 yards from the west side and 600 yards from the east shore. At the end of the chasm is the Eastern cataract, a mill-race something similar to the "Leaping Water." This part of the falls east of the island is mostly bare in the time of low water, and then gives passage to many isolated and narrow streams (see Figs. 5 and 6). The west end of the chasm is but 256 feet deep as measured by Mr. Mansergh, the railway engineer, increasing to 343 in depth at the orifice of the chasm, and increasing to 400 feet below the Boiling Pot. The chasm near each end is not more than 80 or 100 feet wide, increasing to 240 feet in the centre.

The water dropping over the falls nearest the banks has now to turn

at right angles and run the gauntlet past that falling over the centre, for the only outlet is the gorge of about 100 feet in width. Here again the right angle is in evidence, and the southerly course is now resumed. But not for long: 130 yards further it enters the Boiling Pot, and emerges therefrom to run in a trench of 1170 yards long parallel to the first. Only the portion of this parallel trench west of the Boiling Pot is occupied by the stream, the eastern end being now dry, and nursing in its moist, warm, and sunlit depths the coolest and most enticing vegetation of the Palm kloof. This end is divided from the chasm by a very narrow ridge of rock called the Knife Edge, the western end by a wide promontory (on which river pebbles can be found) with a base 416 yards wide, now carrying the Rain forest. To my mind this is an old falls chasm dating from a time when the river passed over the ridge now occupied by the Rain forest promontory, Danger Point, and the Knife Edge, the depression at the east end of which is the extension of the Eastern cataract.

At the land end of the Rain forest promontory the cañon takes a bend at an acute angle to the east in a third cleft, then glides round a third promontory to form a fourth chasm running westwards. Beyond this the zigzag course continues, and little is then known of its vagaries through the 40 miles of the Grand cañon.

All down the valley the tops of the cañon escarpments lie at the same remarkable level as the lip of the falls, the river now running at a level of 400 feet lower than the surface of the basalt sheet. One strong argument against the fissure theory is that every lateral stream and tributary, such as the Masuye, Matetsi, Makone, and the one near Tsherus, after a level course along the lava-sheet, enters the cañon by a deep ravine or "chine" that is being cut back by the same processes which now influence the shaping of the falls. Indeed, the fall of the Masuye river into the cañon is quite worth a visit, the small stream having a sheer drop of about 300 feet.

The confluence of these lateral kloofs, or chines, with the Grand cañon is constantly occurring throughout the whole 40 miles of its course, a fact which makes a journey of investigation extremely arduous, each precipitous gully having to be circumvented, causing many hours' and even days' delay in returning to the main cañon.

As a rejoinder to a theory occasionally advanced, I may say that there is no evidence of the erosion of the chasm, gorge, or cañon having been assisted by the pre-existence of dykes or veins of softer material. Remains or traces of such would exist at either end of the chasm or the Palm kloof, and none can be found.

The Processes which formed the Victoria Falls.—Let us now consider the details of the scheme by which nature sculptured these features, processes which we may learn by observation of present-day conditions.

As before stated, the river has removed the upper strata of fine

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FIG. 6. **VIEW OF FALLS SEEN THROUGH THE JAWS OF THE GORGE.**

Danger Point on the left, the promontory of the "knife edge" on the right.

sandstones, and consequently the level of the stream, the lower flats of the valley, the ends of the chasm, and the edges of the gorge and cañon can be seen to be of the same horizon of basaltic rock. The apron of water and inaccessibility prevent one seeing if the hard top sheet extends in depth for the whole 400 feet of the chasm, but down the cañon (Fig. 9) it can be noticed that the lava does lie in beds in varying thicknesses. The examination of these strata is not possible unless one is slung over the precipice, a feat not yet attempted. The hard surface is a basalt more or less amygdaloidal, on the degree of which quality depends its want of tenacity.

As is common to all rocks of this nature, it is full of cracks and fissures due to contraction on cooling, and though it does not assume the perfectly regular hexagonal columns of the Giant's Causeway or of Staffa, yet it frequently resembles them (Fig. 7), the vertical cracks producing a general columnar form. The columns thus defined may be seen when the water is low, along the lip of the falls, and beneath the clear and rushing current of the "Leaping Water" (Devil's cataract), more or less truncated as the verge is reached, and bearing but little evidence of attrition. Indeed, evidence of actual wearing away of the angular edge of the precipice is conspicuously absent, and, as Fig. 5 will illustrate, the level of the stream is almost unchanged up to the very lip of the falls. Only at the two cataracts at the ends of the chasm can the process of trituration be called in aid as a demolishing agent, and even here it is probable that the columns have been truncated by the action of the rushing water forced into the horizontal joints.

My opinion is that the cutting back of the edge is due to the perpetual hammering action of the vast bodies of water falling into and down upon the cracks between the basalt columns, assisted by the constant vibration of the rock from the precipitated masses of water, and that by this constantly exerted force the columns are rent asunder and fall into the chasm, taking with them huge and deep flakes of the precipice (Figs. 4 and 7). At low water heaps of these blocks, as yet angular and unreduced, may be seen in the shallower ends of the chasm (Fig. 4).

While there are signs some distance away that the basalt flows are bedded in various degrees of tenacity, there is no sign of undermining of the rock that forms the rim, as at Niagara, and so leaving that rim without support; rather does the lower portion of the precipice at places protrude outwards. But the breaking down of the rock is mostly columnar, hence the almost vertical walls of falls, chasm, gorge, and cañon.

Such I believe to be the causes that have played the most important *rôle* in the trenching of this length of 40 miles or so. To estimate or arrive at any approximation of the time that such work has taken is hopeless until points be accurately fixed by which to register the

retrocession of the falls in stated intervals. The rate must depend upon the resistance that the columns on the verge offer to their destroyer, and that we cannot yet surmise, for since Livingstone's discovery until a few years ago visitors were few in number, and a second visit was such a rarity that any alteration in the falls has not been noted. When Baines visited the falls in 1862, he painted the canvases that are now in the Royal Geographical Society's room, and it may be that some day his pictures may assist in appreciating changes in the falls.

At Niagara these changes have been observed, more or less, since they were sketched by Father Hennepin in 1697.

The Niagara and the Zambezi falls each possesses its own distinctive grandeur, and they have so few spectacular features in common that comparison of their beauties is particularly inappropriate. But there are several points in regard to the physical features of the two falls that merit notice. Above the falls, the Niagara river runs over level country that is nowhere more than 30 to 40 feet above its banks until, a mile above the cataract, it becomes embroiled in rapids and descends in the intervening distance some 50 feet, to drop a further 165 feet perpendicularly over the shelving lip of the falls. From the open and broad pool at the foot of these the water runs off in a narrow chasm, 200 to 400 yards wide and 300 feet deep, for a distance of 7 miles, when it enters the quiet waters of Lake Ontario. Like the Zambezi, it has its whirlpool in the gorge, from which the water swirls away at a right angle to its former course.

The Niagara falls are caused by the undermining of a lower bed of soft shale, by which the harder bed of limestone that forms the lip is robbed of its support and falls in large blocks into the bowl beneath. We are told that the sudden descent of huge fragments of the undermined portion in 1828 and 1818 shook the ground like an earthquake. We have as yet no such recorded falls of rock or noticeable recent indentations on the Zambezi to assist in our estimations of time. In the case of Niagara, Sir Charles Lyell conceived that the lip might be conjectured to be eaten away at about one foot per annum, giving a period of 35,000 years for the 7 miles of gorge, while Prof. J. W. Spencer (9) arrived at the figure of 31,000 years. At the same rate, the 40 miles of cañon below the Victoria falls would represent a career of close upon a quarter of a million years, but, as I have already said, there is as yet nothing upon which such calculation can be based.

The Grinding Down of the Cañon.—The process described accounts for the breaking down of the chasm of the Victoria falls above the water-line: another power is at work in the depths below. During the winter, when the water in the chasm is some 40 feet lower; when the mist-veil is lighter, or when it is blown aside so that the eye may penetrate the grey depths of the abyss, the vast blocks that have fallen

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FIG. 7. **VIEW LOOKING INTO CHASM FROM ITS EASTERN END.**

Vertical wall of "knife edge" on the left. Columnar structure of the basalt clearly shown in the rocks on the right, débris of broken down blocks at bottom of chasm.

from the lips and side are seen amidst the foam, black and jagged in the angry water (Figs. 4 and 7). These are constantly on the move, grinding themselves and the rocky bottom as irresistibly as the Alpine glacier, and deepening the channel of the chasm until, on entering the gorge, they disappear beneath the eddying torrents to carry on their constant triturating work unseen. After gyrating in the Boiling Pot, some of these blocks, reduced and rounded in shape, are brought ashore in the back eddy at the end of the Palm kloof, but in large numbers they are carried and deposited in the corners of the cañon, or in the far-off shingle beds of the placid reaches of the middle river. I have collected perfectly elliptical pebbles of the amygdaloid rock at a point 100 miles below the falls.

This sub-aqueous grinding action of the unseen and moving blocks is the second process in the trenching of this mysterious and tortuous canal, a deepening action that is incessantly going on, and which is yearly increasing the difference between the upper level of the river and the gloomy swirling stream lying in the depths of the unapproachable cañon.

Causes of the Zigzags.—With these explanations of nature's wonderful, if simple methods, the geologist will not be permitted to leave the subject; other pertinent questions now arise. Foremost of these is the oft-repeated one, What caused the zigzag course of the gorge and cañon? and if not by a sudden rending of the earth along lines as angular as the lightning's flash, what motives have influenced the present sinuosities of the later-day stream?

I have already claimed that the cutting down of the chasm is solely due to the continuous thrust of the rushing water among the joints of the basalt. Admitted that such is the case, it is obvious that only those portions of rock that are subject to the force of the current must be liable to this flaking action. In my opinion two features are responsible for directing the action of the eroding forces, and they are, the position of the many islands that must, as now, have studded the broad river in its former course, and also the lines of weakness in the basalt along what may be called the master joints or faults. These occur in all rock formations, and are independent of and cut across the subordinate columnar crevices of the falls lava.

If the intruding water finally rends asunder the more local columnar joints, its action will be no less successful in eating its way into and down the main fissures of the country rock, cracks that extend for long distances. Looking at Boaruka island beyond the cataract (Fig. 4), it can be noticed that a stream cutting through the island is falling down a cleft which it is widening in a striking manner. The stream falls down this narrow slit for about the height of the falls, and it can easily be conceived that with the flaking of the basalt therein, in the manner described, there are probabilities of this cleft widening and

receding back in a direction that is diagonally across the present course of the river, and, peculiarly enough, almost parallel to the first arm below the gorge. The erosion of this crevice must be slow at first, but as it recedes back the amount of water intercepted and deviated from the main falls must increase in rapid ratio. It would thus appropriate millions of tons of water that would otherwise proceed to fall over the precipice, of which portions would thus become dry and consequently free from the beating-down action of the stream. A new direction for a strong current is thus set up, the chasm yearly becomes of greater magnitude, and at last attains the grandeur of the main fall. In this manner is probably due the acute angles of the cañon.

The other feature which will influence the future direction of the currents, and therefore of lines of erosion, is the distribution of islands. Relying on my belief in the irresistible action of the flowing water over the rim of rock, such parts as are sentinelled by islands must be proof against decay. To-day there are three important islands on the lip of the chasm, and more than fourteen large ones in the 4 miles of river above the falls, and the power of the water is confined to the channels between. The two cascades at each end of the chasm, influenced in their courses by the islands adjoining them, are now deeper than the lip of the falls, and consequently the water passes down them in great quantities at a time of the year, the dry season, when the lip of the main cascade is but a series of isolated waterfalls. There must, therefore, be more prolonged submission to the moving currents in these channels than at the places that are periodically dry, and the only result can be their deepening, and a growth in importance year by year. In this case there would be formed a long sloping by-wash commencing many yards back, and drawing the river into the present chasm by a rapidly descending series of rapids or cataracts. This may account for the long straight reaches that occur many miles further down the cañon.

With these influences at work—and there is no reason to think that they are different to those which mapped the falls—these peculiar angles and straight runs in the cañon may be explained. There are reasons for believing that, at one time, the former chasm was what is now the ravine known as the Palm kloof, connected with the Boiling Pot, and the adjoining part of the cañon. That the river previously flowed over the Rain forest promontory at the upper level has already been shown, and additional evidence is found in the fluviatile *débris* recently encountered in constructing the railway and approach to the bridge.

The narrow promontory known as the Knife Edge, separating the old chasm from the new, has a depression at its land end and a high mound at its extremity, and, from visual observations, this high end seems to have been one of the ancient islands that deflected the extension of the eastern cataract into the Palm grove. The current

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FIG. 8. **VIEW FROM SECOND EASTERN PROMONTORY OVER DEPRESSED AND NARROW PORTION OF "KNIFE EDGE," WITH FALLS BEYOND.**

Foliage in foreground is that of Palm Kloof.

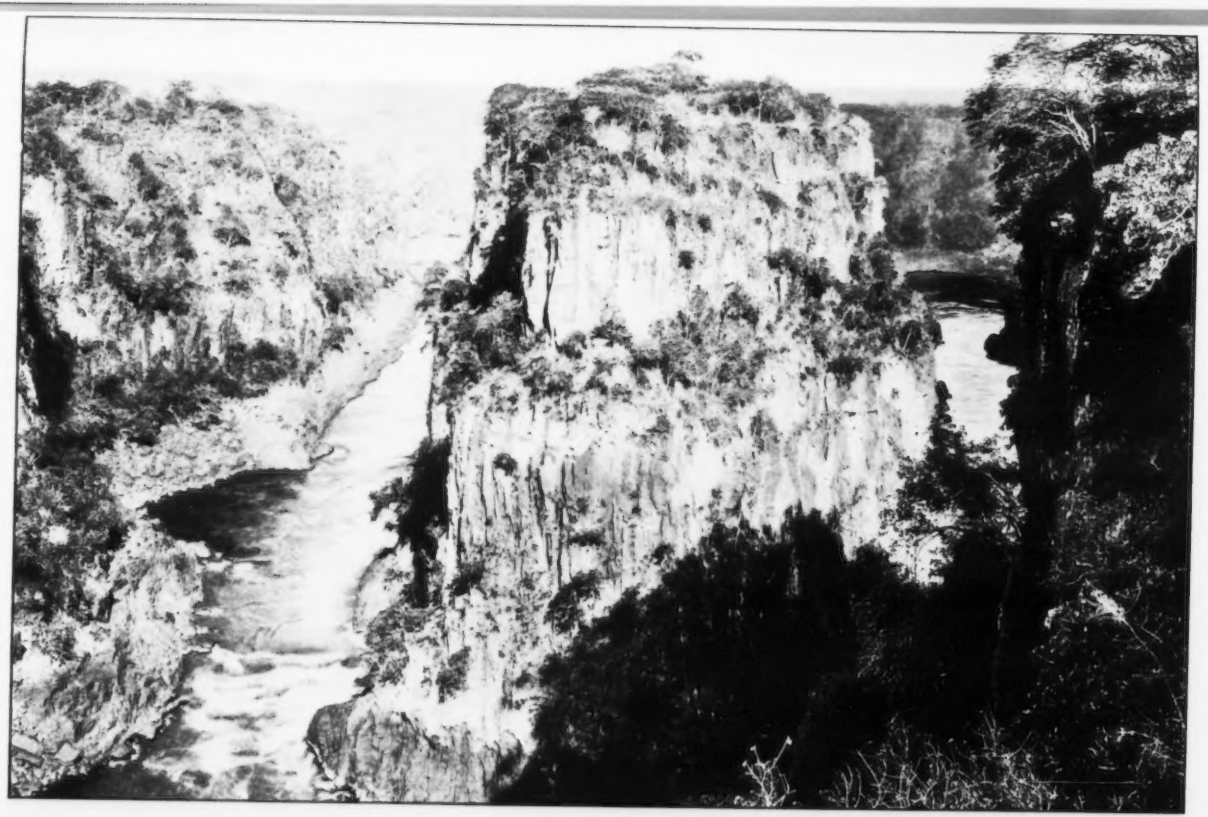

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FIG. 9. **VIEW OF BEND IN CAÑON.**

Taken at time of low river, showing flood mark 40 feet higher. Height above water level 400 feet. Note columnar cleavage of basalt beds, with trees growing in scoriaceous matter between.

may then have continued across the Rain forest table to fall in as a grand cascade, or have run down the old chasm in the form of the sloping rapids that I have shown are growing at the "Leaping Water."

The Falls have checked the Deepening of the Upper Zambezi.—The Batoka basalt extends to the lower end of the Grand cañon, and it may be understood that its eastern fringe would be thin. The backward erosion of the Zambezi from the middle reaches would quickly break into it, but as the thickness of the basalt increased as the river receded westwards, the cutting action would become slower, until the rate of deepening of the middle reach and the cleaving of the barrier of the Kebrabasa rapids far outstripped the slower process of forming the Grand cañon. The result was that the difference between the level of the Zambezi along the top of the basalt sheet at the falls and the altitude of the central reach became more exaggerated as time passed.

In the future this difference must even increase. The basalt sheet extends many leagues westward from the falls, and the bed of the river has cut but little into it since the erosion reached that horizon; for, except in the flood season, the water is beautifully clear and carries but little suspended matter to aid the triturating action. It pushes no boulders along, and the wide reaches of quiet water aid the precipitation of sediment even in flood times, while in winter its clearness and transparency is remarkable. The surface of the basalt sheet is peculiarly level for many miles, and the extent of the wearing down by the river is not more than 20 or 30 feet below the upper surface of that rock.

From the foot of the falls conditions are different; the water is confined within narrow walls, and rushes on with impetuous force, carrying blocks and boulders that must incessantly grind and reduce the already deep bed of the cañon.

Thus the hard and stubborn basalt has prevented the lowering of the upper reaches since first the river met the eastern fringe, and commenced the chiseling of the groove of the Grand cañon. Until the cañon is cut back to the further side of the sheet, no such lowering can take place, and the upper reaches must continue to run, as it were, along the top of the country and amid low-lying hills.

But for this natural weir of basalt that retains its upper waters, the Zambezi might have cut deep into the surface, and become navigable far into the interior. The influence of the falls on the geography of South Africa has therefore been very great.

The Spray Clouds and the Rainbows.—No mention of the Victoria falls would be complete without some reference to the eternal columns of mist that rise from the grey depths of the chasm, or to the brilliant effects of the rainbows that irradiate them. As the vast masses of foaming water are precipitated, with the constant roll of thunder, into the

abyss, they are broken up into comets' tails, again into spray, and still again are comminuted into driving mist. The air forced down with them sets up a current along the cañon, and, ascending in eddies in the chasm, carries with it the spindrift of the dashing spray, and rises in vapoury clouds and columns far above the falls. Baines, in July, 1862 (3), measured the height, by sextant, to be 1144 feet and 1194 feet above the bottom of the gorge; and Edward Mohr, during his visit in the month of June, 1870 (7), calculated that they rose 1055 feet, or 655 feet above the river. The mist-clouds rise higher in the coolness of the early morning than in the noonday heat, while at the time of high water the spray nearly envelops the whole length of the falls.

The column of mist can be seen from a great distance, when open views in the undulating country permit, or higher points of vantage can be gained. From the hill east of the Matetsi river, 40 miles away, it is especially noticeable against the red gleams of the sunset as a dark, smoky column spreading out in an upper layer, while from other places, and at midday, it is of dazzling whiteness. At sundown, looking from the west, the ruddy glory of the afterglow warms it up with orange and tints of flesh-colour, and seems to quicken it into a blithesome guardian of the falls.

It is to this constantly lifting and rolling veil of spray that the Victoria falls owes its most peculiar and elusive charm. No clear and complete view of the depths and distances of the chasm can ever be obtained; the mist throbs and moves across the scene, dimly revealing and again hiding innumerable changing sights. Thus there is always the suggestion of shadowy beauties beyond this gossamer veil; a feeling that we but just touch the glories of this earthly paradise, yet shall never grasp and understand them, stay we never so long.

And amidst this sunlit vapour is born the crowning spectacle of the falls. At every turn and in every view of the water, green foliage, and dazzling foam, the glorious double rainbow follows one, whether in the rich prismatic colours of the daytime or the neutral tints of the moonlight. What wonder that the more ancient native term was, as Livingstone tells us (2), Seongo, or Chongwé, "the place of the rainbow"? For here surely all the rainbows of the world must come to play in the sunlight, before they follow the thunderstorms across the land to bless the rain-chilled beasts and birds.

To the condensing vapour is also due the rich and ever-green Rain forest and the trees of the Palm kloof. This vegetation includes a wealth of ferns, orchids, and palms, rich treasure for the botanist, who must, however, be prepared for the quick and thorough wetting from the never-ceasing rain that descends from the foliage above. Through a framing of dark-green leaves choice pictures of dazzling, foaming

FIG. 10. **VIEW IN RAIN FOREST.**

Photo by Pedrotti, Bulawayo (Copyright)

water will be his reward, and the quiet shady cloisters of the forest are not the least of the beauties that everywhere present themselves.

Beyond the end of the Rain forest the bare promontory of Danger Point lies basking in the sun. Standing here, one may gain a closer idea of the extent of the falls. Far in front is the open blue water of the unsuspecting river, that nearer hurls its fleecy masses across the chasm to one's very feet, and amid the lifting mist-clouds are glimpses of pleasant places, as fleeting as sun-lit dreams. From the grey turmoil of the gorge below rises the continuous diapason of rumbling thunder, grand chords and voices are in the air, and under the deep-blue skies the might and majesty of the falls sink deep into one's soul. With the homage-paying native who comes here to worship the deity, we too must feel the mysterious Presence, and that here, amongst the grandest of nature's works, we stand upon the threshold of the "tablelands of God."

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THE EIGHTH INTERNATIONAL GEOGRAPHICAL CONGRESS.

By HUGH ROBERT MILL, D.Sc.

THE Eighth International Geographical Congress differed from its seven predecessors by the fact that it was held in a continent, and not in a town. The scientific meetings took place in Washington, New York, Niagara Falls, Chicago, and St. Louis, while the informal meetings and excursions included also Philadelphia, the Grand Canyon of Arizona, and extended into Canada on the north and Mexico on the south. The itinerant character of the Congress had advantages and defects; on the whole the latter seemed to outweigh the former, and the experiment is not one likely to be repeated, at least in the form

tried in America. It is certainly advisable to combine long excursions, carefully planned and conducted by able specialists, with the sedentary routine of scientific meetings; but the attempt to hold several sets of scientific meetings arranged by different local officials in various places did not work very well. The members of the Congress did not all make the complete circuit; each town had its own group, and the foreigner had no time to familiarize himself with the new places and people before he was swept on to the next. The inevitable discomforts of frequent change of quarters was apt to induce a certain amount of irritation in those who were unfamiliar with the ways of American hotel and railway life, and who consequently could not anticipate the situations in which they found themselves, nor always make the best of them as they arose. Still, no one could fail to be struck with the earnestness of the organizers of the Congress, who worked untiringly, and with the generous hospitality both of the institutions and the individuals responsible for the meeting.

The local arrangements were not so elaborate as at London or Berlin, but this was due in part, at least, to the short duration of the meetings in each centre, and to a certain extent to the fact that special arrangements for duplicating programmes and proceedings in two different languages, indispensable in Europe, were not required in America, where practically all the members present were acquainted with English. It would have been unnecessary to touch on these matters even lightly were it not that the meeting was an experiment, from which the conclusion may justly be drawn that the scientific part of such a Congress should be held in one place, and the excursions be devoted entirely to the more important and valuable purpose of seeing the country and forming friendships with kindred specialists in comfortable conditions under expert leadership.

The Congress was under the Honorary Presidency of the President of the United States, an unusual distinction for such a gathering in America. The President of the Congress was Commander R. E. Peary, U.S.N., who, with Mrs. Peary, was indefatigable in carrying out all the heavy duties of that position in all the cities visited. The diplomatic representatives in Washington, the surviving Presidents of former Congresses, and the "presiding officers chosen by host societies," viz. G. K. Gilbert (National Geographic Society), Henry G. Bryant (Geographical Society of Philadelphia), R. E. Peary (American Geographical Society), and R. D. Salisbury (Geographic Society of Chicago), were Honorary Vice-Presidents. The general secretary was Mr. Henry Gannett, and the treasurer Mr. John Joy Edson. For the purpose of considering proposals submitted to the Congress, the delegates of foreign geographical societies were invited to assist the Presidency or executive committee of local geographers.

The Congress assembled in Washington, and the proceedings opened

on the evening of September 7, with an informal reception in the Gardiner Hubbard Memorial Hall, the home of the National Geographic Society. On this occasion a welcome was extended to the visitors by Mr. G. K. Gilbert, acting-president of the host society.

On Thursday, September 8, the formal opening meeting took place in the George Washington University. Prof. C. D. Walcott, director of the United States Geological Survey, gave an address of welcome on behalf of President Roosevelt, who had hoped to be present personally, but was prevented. Mr. G. K. Gilbert spoke on behalf of the National Geographic Society, and M. Henri Cordier, Prof. Albrecht Penck, and Mr. Yule Oldham responded for the visiting delegates. Commander Peary then delivered his presidential address, in which he dealt specially with the future of polar exploration, urging that more care be given to organization and equipment, and less thought to relief expeditions, for in such work "the loss of a ship or a few men must be discounted." The meeting terminated after Prof. de Claparède had invited the Congress to Geneva, and Dr. Béla Erödi to Budapest for its next meeting.

The afternoon was spent in visiting the various Government bureaus in Washington, under the guidance of special committees.

At night a very successful reception was given at the Naval Observatory, where the guests were received by Admiral and Mrs. C. M. Chester. At midnight, by special arrangement with the cable companies of the world, a telegraphic time-signal was despatched to all the national astronomical observatories, followed by a message of greeting from the Congress. Next morning replies were read from Greenwich and most of the other observatories in Europe, Asia, Africa, Australia, and America; the Adelaide observatory acknowledged the nearly simultaneous receipt of the signal *viâ* the Pacific and *viâ* the Eastern cables. The Guam observatory replied by an invitation to hold the next Congress in that remote American possession.

Friday was set apart for the reading of papers in general session in the forenoon, when papers on Government Surveys were read, and in sections in the afternoon. The sections dealt with "Physiography," under the chairmanship of Prof. Davis; "Biogeography," with Prof. Heilprin as chairman; and with "Geodesy and Geographic Technology," Mr. J. F. Hayford presiding.

Saturday, September 10, was entirely devoted to the sections, when in addition to Physiography and Biogeography, meetings were held for the consideration of papers on Glaciers, with Mr. H. F. Reid in the chair; and on Meteorology and Terrestial Magnetism, under the presidency of Prof. R. De C. Ward.

In the evening Commander and Mrs. Peary gave a reception at the New Willard Hotel, which supplied a welcome opportunity for the members to meet each other. An interesting excursion down the

Potomac to Mount Vernon was arranged for Sunday, the 11th, when a visit was paid to the tomb and the house of George Washington, the latter brought back as nearly as possible to the condition in which it was during his lifetime.

A late evening train brought a large number of the members to Philadelphia, where a day's sight-seeing had been arranged by the Philadelphia Geographical Society, and Monday, the 12th, was very fully and pleasantly occupied in this way. The arrangements throughout were admirable, and the day concluded with a charming banquet at the Country Club, when Mr. H. G. Bryant presided. In reply to his speech of welcome, the British, French, German, Hungarian, and Japanese delegates responded, their expressions of appreciation being received with the greatest cordiality. The National Anthem, after the speech of the delegate of the Royal Geographical Society, could hardly have been sung more enthusiastically in Canada itself.

On the morning of Tuesday, September 13, the Congress assembled in the splendid new building of the American Geographical Society in New York, when many new members joined to take the place of a large number of Washington members who did not come on. The Congress met in general session at 10 a.m., when Commander Peary welcomed the members in his capacity of President of the American Geographical Society. After a feeling appreciation of the late Prof. Ratzel by one of his lady students, Dr. Martha K. Genthe, Sir John Murray gave an address on Deep-sea exploration, and Count Pfeil on the Rise and development of the German colonies.

The afternoon was occupied by the simultaneous meeting of four sections: Oceanography, under the care of Prof. W. Libbey; Exploration, with Mr. H. G. Bryant as chairman; Economic Geography, under Mr. E. R. Johnson; and Educational Geography, under Mr. Charles R. Dyer. A fifth section on Volcanoes and Earthquakes, with Mr. C. H. Hitchcock as chairman, was appointed to meet after one of the others was finished. It was impossible for any individual to keep account of the progress of the proceedings in all the sections; but a number of papers in most of them appeared in the programme of the following day. In the evening a joint lecture was delivered by Dr. and Mrs. Workman on their mountaineering experiences in the Himalayas. At 9.15 p.m. a reception was given in the Society's house. In the midst of the business of this very busy day, time was somehow found for two meetings of the Presidency and the delegates of foreign societies to consider various questions before the Congress.

The report transmitted by the committee of the Berlin Congress was considered, and various resolutions were adopted. As the result of the deliberation was not officially printed before the close of the Congress, the following notes do not claim to be verbally accurate, nor are they complete, as it seems unnecessary to refer here to matters

on which it was decided that no action should be taken, while some resolutions were postponed until the questions involved had been dealt with in the sectional meetings.

Map of the World.—The report of the committee on a map of the world on the scale of 1: 1,000,000 was received. Thanks were expressed to various authorities in London, Berlin, and Paris for beginning to give effect to the committee's scheme, and it was agreed to represent to the United States Government the advisability of undertaking a general map of America on the same plan.

Polar Exploration.—With regard to Antarctic exploration, the meeting, after expressing satisfaction with the great advances that have been made since the Seventh Congress, adopted the following comprehensive resolution:—

"The Eighth International Geographic Congress, realizing that the only untouched fields for geographical discovery are the regions immediately surrounding the poles of the Earth, desires to place on record its sense of the importance of forthwith completing the systematic exploration of the polar areas. It is very desirable that the experience gained by men of science and officers in the recent Antarctic expeditions should be turned to account by following up without delay the successes they have obtained. The Congress recognizes that the Arctic regions possess a more immediate interest for the people of North America, and expresses the confident hope that the expeditions now being prepared will be so supported as to secure early and complete success."

Earthquake Investigation.—The Eighth International Geographical Congress sends its congratulations to the International Seismological Association, whose further work is waited for with much interest.

Bathymetric Map of the Oceans.—The Congress, in a motion the text of which is not available at the time of writing, expressed its cordial thanks to the Prince of Monaco for his completion of a map of the oceans showing all soundings in deep water, to Prof. Thoulet for exhibiting the map at New York, and to the Committee on the Nomenclature of sub-oceanic forms.

Rules for Geographical Names.—The Congress endorses the views of the Berlin Congress on this subject, and resolves that geographical societies be urged to give the rules wide publicity.

Collection of Records of Drift Ice.—The thanks of the Congress are to be sent to the Danish Meteorological Institute and the co-operating offices for their systematic collection of records of drift ice.

Transcription of Geographical Names.—This subject was postponed for the consideration of the Ninth Congress.

On Wednesday, September 14, the proceedings began with a meeting of the Presidency and delegates at 9 a.m., to consider the place of meeting of the Ninth Congress. Two invitations were before the meeting, and

these were urged by Prof. de Claparède and Dr. Béla Erödi with great earnestness. The discussion at times seemed to indicate that some of the delegates viewed the matter from a tourist's or a politician's point of view, but after the sense of the meeting had been ascertained informally, it was unanimously resolved to accept the invitation from Switzerland, and the Ninth International Geographical Congress will therefore meet in Geneva at a date to be afterwards arranged. A large programme of papers on Oceanography, Meteorology, Exploration, Economic Geography, Educational Geography, Volcanoes and Earthquakes was then gone through in the five sections.

The American Museum of Natural History co-operated with the American Geographical Society in providing accommodation for the various meetings, and each day a buffet lunch was served to members in the museum. A remarkable collection of ancient maps was on exhibition in the Lenox Library, and every facility was afforded for the inspection and study of the exhibits, of which a complete explanatory catalogue was published and distributed.

A dinner was given to the delegates of foreign geographical societies in the Hotel Endicott by the American Geographical Society, at the close of which the President, Commander Peary, announced that he had made arrangements for another attempt to attain a high northern latitude, and expected to sail in a new ship next year.

After two days so full of hard work, the hospitality of the American Geographical Society in providing a trip on the Hudson river for Thursday, September 15, was greatly appreciated. The day was cool and bright, with a fresh breeze, and the beautiful scenery of the Palisades and the hills bordering the gorge of the Hudson were seen at their best. Prof. W. M. Davis described the geographical features, and on the summit of Mount Beacon gave a fascinating exposition of the geographical history of the great landscape which lay open to the eye from that breezy height. At sunset a parade of the cadets at the United States Military Academy at West Point was held, and after witnessing the evolution of these splendidly drilled youths in their picturesque early nineteenth-century uniforms, the party, still guests of the American Geographical Society, entered a special train of Pullman cars which was to be their home until their arrival at St. Louis.

Friday, September 16, was spent at Niagara Falls, the forenoon in individual rambles through the Island Park, and then, after a brilliant lecture on the falls by Mr. G. K. Gilbert in the Opera House, a circular trip was made on the electric cars around the gorge. The tremendous works for the new electric power-house on the Canadian side were well worth seeing, though they have (temporarily it is to be hoped) destroyed the beautiful Victoria Park. A less excusable blemish on the Canadian side was a gigantic advertisement disfiguring the whole view, and sufficient by the grossness of its inappropriateness

to make every British subject for ever forswear the commodity, the name of which disgraced one of the grandest sights of the Empire. The American side of the falls is kept in perfect taste. From Brock's monument at the edge of the Niagara escarpment on the Canadian side, Prof. Davis explained the geographical history of the district.

The whole of Saturday, September 17, was spent in Chicago, where the scientific meeting, at which a few short papers were read to a singularly appreciative audience, was arranged by Miss Zonia Baber, the secretary of the Chicago Geographic Society. The authorities of the University received the Congress, and President W. R. Harper gave a brief address of welcome, which was responded to by Commander Peary.

The buildings of the university were visited, and the various departments inspected. A drive through the large parks and a visit to the Field Columbian Museum filled up the time before dinner. Afterwards such of the members as were not too much fatigued with the heat and hurry of the day, or baffled in the endeavour to find the building by ignoring the guides provided, took part in a reception by the Chicago Historical Society in their interesting fire-proof hall, where there is no wood, the very chairs and picture-frames being all of metal.

Next day was spent in travelling to St. Louis, where the Congress partially merged itself in the International Congress of Arts and Sciences, both being held in the noise and glare of the largest International Exposition which ever was held or probably ever will be. The great defect of this great Exposition was its size, and the absence of any guide-book to indicate the objects of special geographical or general scientific interest was much felt. The multitude of interests represented in the daily programme of the Exposition fairly swamped the Geographical Congress, while the inadequate accommodation, and imperfect organization for the many separate meetings of this and the Congress of Arts and Sciences made attendance on them neither easy nor satisfactory. At the meeting of the Geographical Section of the latter Congress neither chairman nor secretary nor any representative of the committee of arrangements appeared, and but for the presence of Prof. Israel C. Russell and Prof. Chamberlain, who voluntarily assumed these duties, the meeting, which was attended by about thirty persons, could not have taken place.

There was a general session of the Geographical Congress on Tuesday, the 20th, meetings of the section on Anthropogeography on the 21st and 22nd, and of the historical section on the 22nd, the programme of each of which contained a considerable number of papers.

Commander Peary gave a reception one evening on the deck of

the "Arctic Ship Discoverer," a showman's copy of the *Windward* in the ice, and he delivered a popular lecture in the Festival Hall, the great central building of the Exposition, on the evening of Thursday, September 22, at the close of which the Eighth International Geographical Congress was finally adjourned.

So far as the Exposition itself was concerned, there was general unanimity in the opinion that the greatest interest geographically attached to the Philippine exhibit. This included a gigantic map of the Philippine Islands represented on the true curvature corresponding to the scale, and surrounded by a raised platform which made it possible to study every part of it in detail. In addition to exhibits of the typical products of the islands, there were groups of natives of various aboriginal tribes, dwelling in villages which were admirably arranged, and carrying on their usual pursuits.

After the week's immersion in the cosmopolitan chaos of the Exposition, the substantial comfort, rest, and quiet of a special Pullman train on the splendidly equipped Atchison, Topeka, and Santa Fé railway afforded most welcome relief to a large party who undertook a tour to the Grand Canyon of the Colorado river in Arizona, and onward into Mexico, where they became guests of President Diaz. The earlier portion of the trip was an unclouded success, though later a heavy rainstorm and "washouts" on the line caused delay and discomfort. Visits were paid to several settlements of the Pueblo Indians and to the natural wonders of the Grand Canyon and the Petrified Forest, both of them unique each in its own way. The impressiveness of the Canyon transcends that of Niagara itself. The train, after running for hundreds of miles over the waterless plains of New Mexico and Arizona, rising gradually to 7000 feet above sea-level with hardly a hill to be seen, stops suddenly on the edge of a chasm 5000 feet in vertical depth and more than 10 miles across, its sides carved into intricate systems of pillars and buttresses of the most brilliantly contrasted colours, while on the plateau, rather more than halfway down the luxuriant green bordering a tributary stream seems to be rich grass, until the descent of the Bright Angel Trail reveals it in its true character of a grove of tall willows.

Throughout this trip the presence of Prof. Davis, Prof. R. T. Hill, and Prof. Penck ensured that no feature of the geography was passed by without its full bearings being explained; while the infinite incidents of the journey, with many changes of time-table and minor modifications of route, were watched over by Dr. MacCormick, as secretary of the Congress, and Dr. Day, who took charge of the transportation arrangements.

The general impressions left upon the mind by the whole visit to America is, that the Congress attracted less public notice and drew far smaller audiences than in London or Berlin, but that the people who

did attend were keener in their interest and more whole-hearted in their devotion to the study of geography than corresponding audiences in the old world. The hospitality of the four geographical societies which took a share in entertaining the Congress—those of Washington, Philadelphia, New York, and Chicago, to enumerate them in the order of the priority of their opportunities—was absolutely unbounded, and the expense incurred by them must have been great. Although a few names have been mentioned in the course of this report, it has been impossible to refer to more than a small fraction of the number who cut short their holidays and ungrudgingly gave up their time to the entertainment and guidance of fellow-geographers from other countries. To the officers of all these societies the thanks of all the delegates were specially due, and although the circumstances of the conclusion of the Congress were not favourable for an adequate expression of thanks in detail, the American hosts commanded the gratitude of the geographers of all countries.

RESOLUTIONS ADOPTED BY THE EIGHTH INTERNATIONAL GEOGRAPHIC CONGRESS, SEPTEMBER 13, 1904.

The following resolutions have been forwarded officially:—

Rules for Geographic Names.

Local names are as far as possible to be preserved, not only in those regions where already established, but also in wild regions. They should on this account be determined with all the accuracy possible.

Where local names do not exist or cannot be discovered, the names applied by the first discoverer should be used until further investigation. The arbitrary altering of historical, long-existent names, well known not only in common use, but also in science, is to be regarded as extremely unadvisable, and every means should be employed to resist such alterations. Inappropriate and fantastical names are to be replaced, as far as possible, by local and more appropriate names.

The above rules are not to be rigorously construed, yet they should be followed to a greater extent than heretofore by travellers and in scientific works. Their publication in periodicals as the opinion of Congress will probably prove of great weight. Although in recent years many official systems of determination of geographic names have been enunciated, we have still evidence of the very slight influence which the wishes of the International Geographic Congresses exert over the decision of the official authorities. To this geographical societies are urged to give wide publicity.

Introduction of the Fractional Scales of Maps.

The Seventh International Geographic Congress expressed the urgent wish that upon all charts, including those published by those lands still employing the English and Russian systems of measurement, along with the scale of geographic co-ordinance, that the scale of reduction should be expressed in the usual fractional form, $1 : x$, and that the latter be added to all lists of charts covering land and sea, and requests the executive committee of the Congress to bring this decision to the attention of all governments, geographical societies, and establishments engaged in the publication of charts.

The advantage to be derived from the support of this resolution, which has its origin with the editor of *Petermanns Mittheilungen*, and the extensive dissemination of the resolution, is at once evident. In English publications a custom has arisen of adding a statement of the ratio $1 : x$ to the usually employed x miles to one inch. In America the custom has arisen of going even a step beyond this, namely, the addition of the ratio of reduction has led to the direct application of the decimal system in the units of measure adopted upon the charts.

To this geographical societies are urged to give wide publicity.

The Decimal System.

The Seventh National Geographic Congress expresses itself in favour of a uniform system in all geographical researches and discussions, and it recommends for this purpose the employment of the metric system of weights and measures, as also the employment of the Centigrade thermometric scale.

It is, moreover, highly desirable that there should always be added to statements of the Fahrenheit and the Reaumur scales their equivalent upon the scale of Celsius.

Similar is this question of the metric system, which reaches even more deeply than the former into the well-established customs of daily life, and has proved not without value in promoting international uniformity and simplicity. Although the metric system of weights and measures has made slow progress, and this alone through the portals of scientific work, its application to geophysics and geography has already made a fair beginning. In England a special organization entitled the Decimal Association has taken charge of the matter. The Commonwealth of Australia has entrusted the subject to a commission. We are without knowledge of the efforts in this direction thus far made in Russia.

To this geographical societies are urged to give wide publicity.

Standard Time.

Resolved, in view of the fact that a large majority of the nations of the world have already adopted systems of standard time based upon the meridian of Greenwich as prime meridian, that this Congress is in favour of the universal adoption of the meridian of Greenwich as the basis of all systems of standard time.

Publication of Photographs.

It is suggested, by the lantern slides shown by Mr. Siebers and by the photographs by Mr. Willis, that it is desirable that in these and the cases of other exploring travellers photographs of geographical significance might be published, and accompanied by short explanatory notes, so that they may form collections of representative physical features of different parts of the world.

MR. R. L. REID'S JOURNEYS IN PORTUGUESE EAST AFRICA.*

THE following notes are taken from the account of two exploring trips in the region north of the Pungwe river, Portuguese East Africa, sent to us by Mr. R. L. Reid, who has twice traversed the district for the purposes of sport, in 1900 and 1902, making a rough survey of the country with the prismatic compass. The accompanying sketch-map shows the results of his survey, which adds a considerable amount of

* Map, p. 120.

detail to the best maps hitherto available, which have been based mainly on that compiled by Mr. Ravenstein and published in the *Journal* for January, 1895, on which the routes of Andrada and other Portuguese explorers of this district were laid down. Having with him no instruments for accurate determination of positions, Mr. Reid has been obliged to take these earlier maps as the basis for his own, filling in the details, however, from observations on the march or in camp.

On the second and more important trip (August to December, 1902), Mr. Reid started north from Musasa le Baron, a station of the Gorongoza Company, situated at the lower end of the flat island of Manangora, which lies between the Pungwe river and its branch, the Dingi-Dingi (the latter the larger stream, and the one always used to travel by). Crossing the Dingi-Dingi by a ford east of Mapanda's village, he reached, at the junction of this river with the Urema, the site of the old Portuguese station, known as Laforte, and continued north across the flats of the Urema valley, crossing a number of small rivers which descend from the Nyamonga range, and flow west towards the Urema. Makaia, shown on existing maps as an important place, is really represented only by one hut presided over by a Portuguese trader, half a mile from Bomba, the village of the chief Mwanambu Mtonia. Beyond this the paths near the Urema are only used during the dry months, the best path, passable at all seasons, striking off to the north-east. Following this, Mr. Reid found that the matted grass of the Urema flats gave place to a finer kind, with bush and forest, though the streams were still marked by great flats ("tando") dotted over with baobabs. Where crossed, some of these streams were running strongly with clear water, but most, if not all, lose themselves in sand before reaching the Urema, to which paths, used by fishing parties, lead across the tando from the villages. It is here known as Kombedzi, and further north as the Mukwa. Beyond Mapakuti the country rose rapidly, and was intersected by high ridges sparsely forested. Some of the streams crossed contained numbers of fossil shells in their beds. Majamba, the headquarters of the Portuguese delegate for Sheringoma, was passed, and the highest point reached at the village of the chief Nyabava, the centre of a grain district. Beyond this the country falls again, the forest giving place to thickets and grass, with Borassus palms. Before reaching the site of the old Portuguese fort at Gudo, the country became poor and sparsely inhabited. No rain had fallen for months, water was scarce and bad, while no food was to be obtained for the men. At Sabuko, whence a fine view was obtained across the Zambezi to Mount Morambala, it was necessary to turn back, the country nearer to the Mukwa being explored during the homeward march. The river, known also as the Zangwi, here showed plain signs of running towards the Zambezi, though the natives say that during a high flood in the latter the direction is reversed. The water is here very salt and bad to drink.

Further south there is no well-defined channel for a considerable distance, and abreast of Nyabava's the tando was quite flat and waterless for miles, though there are places where, in heavy floods, the water must spread over a width of 10 to 15 miles. The exact spot where the turn of the water takes place is thus difficult to define. After passing Nyabava's once more, Mr. Reid took the lower road over the flats, finding game fairly abundant, and got back to Bomba on November 3.

From Bomba, Mr. Reid made some trips over the low-lying deltaic tract between the Urema and Dingi-Dingi, which is passable only at the driest time of the year. The Zangwi, which runs across it, is more a succession of swamps than a river, but always contains water in a more or less well-defined channel. The flats on this side are pretty thickly inhabited by an agricultural population, and the wine palm is abundant, groves of it extending to the edge of the Sungwe plains. The view across the tando on emerging from the timber is rendered striking by the effects of mirage. A route for the hill country of Gorongoza was taken along the edge of the palm forest. The Muzikazi was crossed (its water being salt and bad), and a camp formed near the foot of the mountains at Mombezi. Basalt was seen here both in the high ground and in the plain. Going north, Mr. Reid crossed many streams running with clear cold water, and reached the Vanduzi (the upper course of the Sungwe), a fine stream with water pouring over huge boulders. It may be considered the real head stream of the Urema. The soil along the banks seems very rich, and the country is thickly settled, though here, as elsewhere, the people were suffering from the prolonged drought. This soon afterwards broke up, and Mr. Reid decided to return to the coast, making his way with some difficulty down the Urema, which was blocked with a kind of sudd 18 inches thick in places. The Pungwe was very low, and the influence of the tide was distinctly felt as far up as the junction with the Dingi-Dingi.

HYDROGRAPHY OF THE ANDES.*

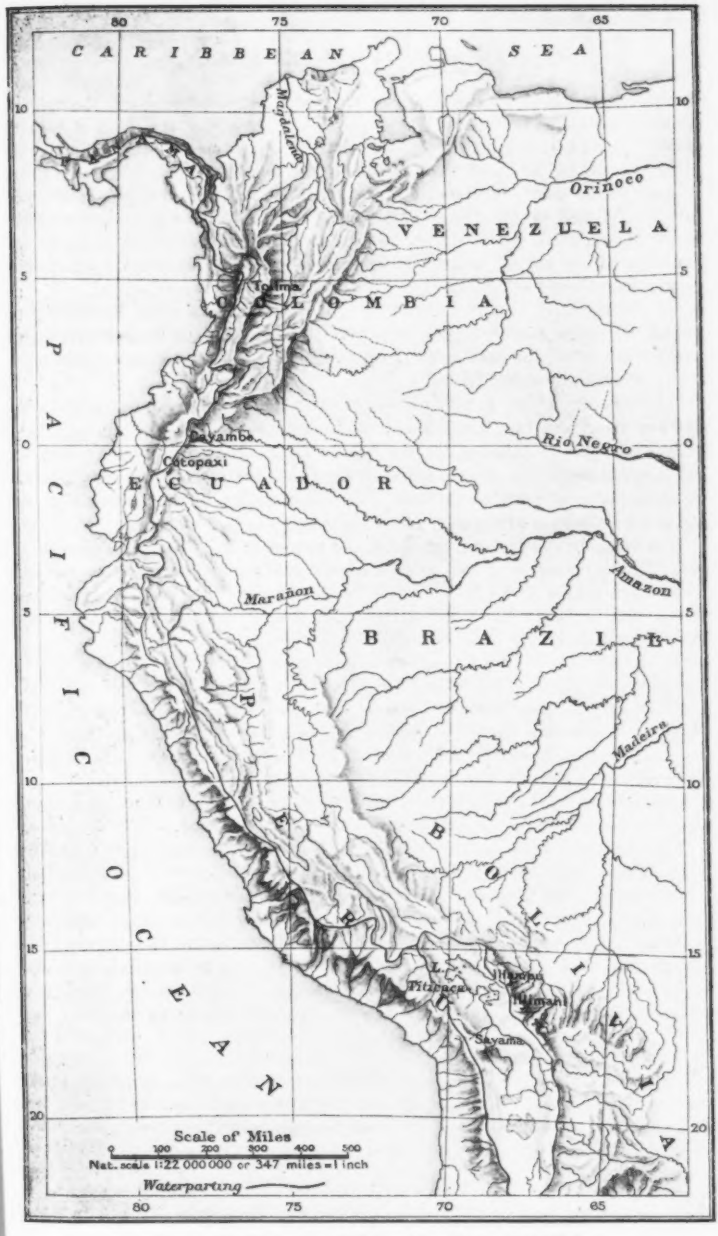
By Dr. J. W. EVANS.

An examination of the configuration of the Andean region will show at once that it is closely related to the direction of the prevailing winds and consequent distribution of the rainfall. The watershed appears almost invariably to take a line removed as much as possible from the direction from which the winds blow that bring the moisture to the mountains.

In the extreme north, in the region of the north-east trades, the rivers flow north-north-eastward parallel to the Pacific coast from as far south as lat. 2° N. to the Caribbean sea.

In Southern Colombia and Ecuador, where winds laden with moisture reach the

* Research Department, 1904.



THE RIVER SYSTEM OF THE ANDES.

(Northern Portion).

To illustrate the paper by Dr. J. W. EVANS.

mountains both from the east and west the watershed runs irregularly through the centre of the mountain area; while in the long stretch from the north of Peru to about 33° S., throughout which south-eastern winds prevail, the hydrographic divide that limits the Pacific drainage keeps well on the western side of the great Andean plateaus, and the drainage of the mountain region to the east either flows into the Atlantic or never reaches the sea. Further to the south north-westerly winds replace those from the opposite direction, and the watershed shifts to the eastward. From lat. 41° to the southern extremity of the continent it follows the eastern foothills of the Andes.*

In the region of east winds most of the rivers that drain the Andes traverse the loftiest ranges in deep gorges from west to east; while in the latitudes where west winds prevail, the main chain is repeatedly passed in the opposite direction by rivers on their way to the Pacific.

The relation which I have shown to exist between the winds, rainfall, and rivers of the Andes furnishes evidence that through the long ages during which the present hydrographical system has been worked out, the direction of the winds and distribution of the rainfall have remained essentially the same, though minor variations have no doubt taken place. The exact manner in which these meteorological conditions have influenced the rivers remains to be considered.

The most obvious explanation is that the courses of the rivers have been "cut back" by the operation of rain and other subaërial denuding agents, but my own observations in the Andes have led me to believe that this process is too slow among hard rocks to account completely for the present configuration of the river system, though no doubt it has had its share in bringing it about.

In my recent paper on Caupolican I have given reasons for believing that in Bolivia and the south of Peru the true explanation lies in the fact that the rivers that traverse the great mountain ranges from the lee (western) to the windward (eastern) side are older than those ranges, and have been able, with the help of an abundant rain-supply, to wear down their channels as the mountains rose across their paths, while the streams that flowed in the opposite direction were liable to have their courses barred by earth-movements across their line of flow during a period of rainlessness caused by the rise of mountains to the windward.

I am persuaded that similar reasoning will suffice to explain the hydrography of the Andes throughout their length.†

In Patagonia the gorges through the Andes are not the work of the streams which now occupy them, and which date only from the last and still incomplete emergence of the southern portion of the continent from the sea. They were excavated by older and longer rivers that, before the Andes were raised, flowed from a region of ancient rocks in Eastern Patagonia,‡ now almost completely hidden under the detritus laid down in periods of submergence in Secondary and

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* Except for a short distance, where it withdraws to the central line of the Cordillera.

† The inland systems of drainage of the central and eastern Andes between lat. 14° S. and 35° S are due to the fact that the supply of moisture carried by the south-east winds that pass over the comparatively cool Argentine pampas is less than that brought by the similar winds that blow over the warm, well-watered Amazonian region further north, which must yield almost as much moisture as an inland sea. Even in oceanic regions the trade winds contain less moisture the greater the distance from the equator. The whole of the area included in these inland systems appears at one time or another to have drained into the Atlantic.

‡ See Dr. F. P. Moreno, "Explorations in Patagonia," *Geographical Journal*, vol. 14, p. 367.

THE RIVER SYSTEM OF THE ANDES.

(Southern Portion).

To illustrate the paper by Dr. J. W. Evans.

Tertiary times.* These rivers continued, with the help of the rainfall brought by the western winds, to keep open their channels while the earth-foldings occurred which formed the present Cordillera.

The accumulations during periods of depression of marine deposits derived from the denudation of the mountain slopes or the eruption of volcanoes has sometimes shifted the watershed in the intervening epochs of elevation westward to the gorges,† but with the help of the rains from the north-west the Pacific streams at once commenced to cut their way back to the eastward through the unconsolidated material that filled the old channels; and in many places the process is still going on.

The history of the rivers of the region has been complicated by subsequent earth-movements that have raised new subsidiary elevations to the east of the main axis and depressed the intervening valleys, and, during the last submergence, by arctic conditions, that clothed the mountain slopes that remained above the sea-level with enormous glaciers, which penetrated at their base far down below the surface of the ocean, and, when the land was raised and the climate became milder, left the deep lake-basins that fringe the eastern margin of the Cordillera.

In the extreme south there are fiords, such as Otway water and the western part of the Straits of Magellan, which are ancient river valleys still submerged in the sea. These too were, I believe, carved out by ancient streams that flowed into the Pacific before the Andes rose across their paths.

It is not only in the Andes that we find evidence of similar relations between the winds and rivers; there are many other parts of the world where considerations such as those I have suggested will throw light on the present hydrography and assist us in reading the history of the past. The long period during which the meteorological conditions in the Andean region have remained comparatively unchanged, and the north and south extension of the mountains, render it a peculiarly favourable area for recognizing the effects of the prevalent winds in different latitudes on the river system.‡

Sir Thomas Holdich: Whilst I agree with the general deductions which Dr. Evans has drawn from the conformation of the Andes, viz. that the watershed appears to shift gradually away from the direction in which the wind blows, I think that there are certain very important exceptions to the rule, particularly in the southern part of the Andes. I am not acquainted with the northern section, but as regards the Patagonian Andes, I have had the opportunity of looking pretty closely into their structure, and I found that the watershed there zigzags backwards and forwards, not by any means always along the eastern foot of the hills, but sometimes approaching so closely to the Pacific shore that it had to be condemned as a possible

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* These rivers appear to have followed the still older transverse and longitudinal valleys of the ancient axis of elevation which stretched from north-west to south-east. See Dr. Hans Steffen, "The Patagonian Cordillera and its Main Rivers between 41° and 48° South Latitude," *Geographical Journal*, vol. 16, p. 38.

† The great river valleys of the pampas have been excavated in the course of successive elevations, at times when the watershed retained its western position. They probably followed, in the first place, the line of the valleys of the ancient westward-flowing rivers covered by deep accumulations of sediment, but still represented by depressions.

‡ The inset map illustrating the rainfall of the Andes can only be regarded as diagrammatic, as materials for an accurate representation of the rainfall are wanting throughout the greater part of the area.

boundary, because it gave insufficient hold on the Pacific coast to Chile. The principal exception is at a point not marked on the map exhibited. Lakes Viedma and Argentina both have an Atlantic outlet; and the watershed of the continent, the main divide, is situated so far to the west of them as almost to overlook the sea. As the two lakes occupy considerable space, this is a big exception to the rule; but still I think, on the whole, that rule holds good. Dr. Evans mentioned something about Lake Buenos Aires. Lake Buenos Aires is a very remarkable hydrographical feature, and I am not quite sure that I know of any other like it elsewhere. A very curious feature occurs with regard to the source. Lake Buenos Aires draws most of its waters from northern glaciers by means of a biggish river called the Fenix. For about 30 miles that river holds its own as an important stream, until it divides into two channels, one flowing to the lake, and through the lake to the Pacific, and the other to the Atlantic. What are we to call such a feature as that? The river itself becomes the actual water-divide of the country, so far as I can see, rather upsetting the usual theories of a *divortium aquarium*. There was another point about Dr. Evans's address with which I hardly agree. He says, "In Patagonia the gorges through the Andes are not the work of the streams which now occupy them, and which date only from the last and still incomplete emergence of the southern portion of the continent from the sea. They were excavated by older and longer rivers that, before the Andes were raised, flowed from a region of ancient rocks in Eastern Patagonia, now almost completely hidden under the detritus laid down in periods of submergence in Secondary and Tertiary times. These rivers continued, with the help of the rainfall brought by the western winds, to keep open their channels while the earth-foldings occurred which formed the present Cordillera." I have often discussed that question with the well-known Argentine scientist, Dr. Moreno, and Dr. Moreno was of opinion that there was no evidence of antecedent drainage. That is to say, the lines the rivers have taken have not existed from all times, but their extraordinarily irregular course has been determined by the lines of weakest resistance, probably due to volcanic action. Nor can I agree that the general conformation of the Andes has remained the same for so very long. It is certain that very great changes in altitude have taken place in different parts of the Andes lately. Some parts are still rising, some falling. There is no general elevation; there is no general depression. In one place you will find forests submerged under the sea, and not far away you will find modern shells on the cliff edge hundreds of feet above your head. I might also remark that with these constant changes in the elevation that have taken place, the lake region of South America has changed its outlet constantly, sometimes on the one side and sometimes on the other. I think Dr. Evans is right in saying that the majority of the lakes have now a westward outlet into the Pacific; but a great many still have outlets to the Atlantic, and in almost every case in which we observed the present conformation of those lakes, we found distinct evidence of a former exit to the Atlantic.

Mr. R. D. Oldham desired to express his admiration of Dr. Evans's very interesting paper. In it the good old idea of antecedent drainage had been accepted wholeheartedly—an idea which was both popular and venerable, and consequently to be treated with respect. It had been fully established in certain cases, such as the channels of the Himalayan rivers through the sub-Himalayan ranges, and of the Lune valley in England, but he was unaware of any instance where it had been proved that a river had been able to cut down its channel and maintain its course across anything which could be described as a mountain range, while in all the established cases the source of the river was in a higher range than that across which its course had been maintained. The case of the Indus and Brahmaputra

had been referred to, and though he stood committed to the notion that the course of these rivers across the Himalayas was older than those mountains, yet, since the date of the publications in which this view had been accepted, he had seen cause to modify his opinion, and was more and more inclined to accept the alternative explanation of capture, an explanation which certainly seemed the most probable one in the case of the Sutlej. On the western frontier of India many of the gorges which were ordinarily explained by the theory of antecedent drainage seemed to him more probably cases of capture. He did not think that Dr. Evans had made sufficient allowance for the rapidity with which erosion and cutting back of valleys might take place in rising mountains. He had found that the Scind valley, which drains into Kashmir from the north, had extended its valley by 20 miles, and at one place the old valley-level stood over 2000 feet above the present; the whole of this lengthening, as well as the 2000 feet of erosion through hard limestone, having taken place since the last, and least considerable, extension of the glaciers—that is to say, since a date which is certainly not older than the close of the Glacial period. In view of these considerations, he was inclined to think that the close relation between the direction of the prevailing winds and the position of the watershed, which Dr. Evans had described, indicated that the present hydrography of the Andes is more largely dependent on capture than on antecedent drainage.

Dr. HERBERTSON: We have listened to a most interesting paper, and I think that Dr. Evans's suggestion that rainfall has considerable control over the position of a watershed ought certainly to be applied to other regions than the Andes. As to his theory of the origin of South American rainfall, I should like to enter one or two protests, more particularly about the rainfall in central Chile, which I do not think can be explained by the heating of Argentina. It is a winter rainfall, not a summer one, and is brought by the ordinary westerly storm winds of the southern hemisphere in their most northerly position. I also think that the south-east trade wind is not accountable for most of the rainfall in the Amazon valley, much of which can be explained as due to locally uprising air or monsoonal brought in by a more northerly wind. But those points have nothing to do with the main thesis which has been discussed this afternoon. The chief objection to Dr. Evans's antecedent drainage explanation has been raised both by Sir Thomas Holdich and Mr. Oldham. In the case of the Southern Andes, the drainage from Lake Buenos Aires is very remarkable. The tributaries of the main streams, as Sir Thomas Holdich said, nearly all run the wrong way. You have tributaries running in the opposite way to the main stream. This happens with most of these west-flowing South Andean rivers, and is an indication of a change of the direction of flow in the main valley. There is another point of some importance. I was especially delighted to hear Mr. Oldham renounce the antecedent theory for the Ganges, because I have ventured within the last year or two to express the opinion that it could not explain all the gorges in the Himalayas. If you make a valley-curve, you find, in the case of the Himalayas, and also in the case of the Andes, that you have a curve which becomes almost flat; then as the river passes through the mountains turns very steep, and then is relatively flat again. Now, if the river had cut its way through rising land, the nick in the curve at the end of the upper flatter part where there had been a temporary base would take place along the axis of most rapid elevation. In the Andes that nick seems to occur on the eastern side of the mountain system, and that is what one would expect if the waters of the rivers on the dry side of the mountain had been tapped by the more vigorous rivers on the wet western side. I should also like to ask Dr. Evans if he has any definite evidence of rivers which now flow to the west of the Southern Andes

through old gorges, if the old deposits have been observed in them, and if there are valleys with old deposits which are not occupied by any river flowing to the west at the present time.

Sir CLEMENTS MARKHAM: I should like to make a few observations. In the first place, I wish to point out to Dr. Evans that north of the Cerro Pasco knot the great rivers work to the north just as the Atrato and Magdalena work to the north to the Caribbean sea. In the same way, the rivers Huallaga and Marañon work to the north, to what may be called the Amazonian sea. I should like to call attention to one very remarkable feature in the Andes, namely, what is called the Callejon du Huaylas, in which a river close to the Marañon has a course for many miles due north, and then turns the other way into the Pacific. If you look at that map you will see what an extraordinary feature that is. All those rivers—Huallaga, Marañon, Huaylas—appear to be working northward, and not to the eastward. I would also refer to the period when the Andes are supposed to have risen to their present great height, which you place, I think, in the secondary period.

Dr. EVANS: They have risen recently as well.

Sir CLEMENTS MARKHAM: I should imagine the rise to be very much more recent. If, as we find in the coast deserts, there are fossil animals in enormous quantities which require dense forests to live in, like the gigantic anteater, there cannot possibly have been lofty mountains entirely stopping the rainfall from coming down on the coast. The Andes must have been much lower, rising gradually. It is also evident that at that period, when those creatures existed, there must have been abundant vegetation where there is now a sandy desert. I have always felt very strongly that it was impossible that those enormous ruins could have existed on the coast of Lake Titicaca, if it was at its present height when they were built. The land must have been lower, sufficiently low to allow grain to ripen, for the builders represented a dense population.

Dr. EVANS: In reply to our President's question as to the age of the Andes, I can only say that I do not regard the range as of very great antiquity, as the term would be understood in geology, and agree with him that considerable elevation has taken place in comparatively recent times; but it is probable that throughout Tertiary and even later Secondary times the mountains, though not, it may be, as lofty as at present, were sufficiently high to diminish materially the rainfall to the leeward.

At an earlier period, instead of a continuous mountain chain with a general north-and-south direction, there appear to have been several disconnected elevations with a north-west to south-east strike. The north-eastward flow of the Peruvian rivers referred to by the President probably dated from a time when there was a gap between the Peruvian Andes and the mountains in the south of Colombia.

If the general relation of the winds, rainfall, and watershed for which I have been contending is established, the main purpose of my paper is accomplished, though the question of the manner in which that relation has been brought about remains to be considered. I cannot agree with Mr. Oldham in the importance which he attributes to the operation of cutting back. Except where limestones, comparatively unconsolidated materials, or rocks that have been softened by laterization are concerned, the rate at which a river cuts back at its source is, I believe, so slow that it cannot affect the hydrography and orography of a mountain region to any considerable extent, even in the vast periods with which geology deals.

In my opinion, it is by the antecedent character of the river system that we must explain the main features of the hydrography, not only of the Andes, but of the Himalayas and many other great mountain regions. This is a much more

reasonable hypothesis, for it supposes the great mountain gorges to be the work of the waters of considerable streams and the stones they carry along their beds, which are far more efficient excavating agents than the surface flow that forms a river source. In this position I have the powerful support of Prof. Bonney, who is unfortunately unable to be present, but has addressed me a letter on the subject (see below).

The facts adduced by Sir Thomas Holdich are full of interest, but are not, I think, inconsistent with the views I have advocated.

The seemingly erratic course of the transandine rivers of Patagonia points strongly to an antecedent system of drainage, following, like the Thames, alternately dip-and-strike courses roughly at right angles to one another; but in this case the dip and strike are not those of the elevation of the present Andes, but of earlier earth-movements oblique to them.

Mr. Herbertson has referred to the fact that the rainfall in Central Chili occurs mainly in the winter months, and suggests that this is inconsistent with the view that the summer heat of the Argentine plains causes an indraught from the west. The winter rain is due to the increase of the north-west winds in the winter, which is not a local phenomenon, but occurs throughout the south temperate zone. But the wind charts of the south Pacific show that, relatively, the north-west winds are more prevalent in summer and less prevalent in winter off the coast of Chili than at other points in the same latitudes.

With regard to the direction of the rain-bearing winds of the Amazonian plains, I can testify from my own experience that in the portion which falls within the limits of Bolivia by far the greater part of the rain comes from the south-east. In the north of Brazil a different state of things no doubt prevails.

Mr. Herbertson also referred to the valley curve or profile of the western-flowing rivers of Patagonia, and refers to the fact that the steepest part is to the east of the principal range. This is, however, due to the fact that the land is now far below the level at which it stood when the gorges through the mountains were excavated, and the original valley bottoms are now either submerged below the sea or covered with *débris* brought down by the rivers.

In conclusion, I may mention that I believe that the present eastern drainage of peninsular India south of lat. 21° N. dates from a period when the normal north-east trade winds blew over it throughout the year, and all the rainfall came from that quarter. The present south-west monsoon is the result of the great extent of land to the northward, much of which was still covered by the sea as late as Eocene times.

Rev. Canon Bonney wrote as follows to Dr. Evans: That when a river cuts through a range the latter is the younger, is a statement to which it would be very difficult to find an exception. I have long been convinced of this, and have stated it in print, in the case of the Alps and Himalayas; also that South America, south of about lat. 41 S., is a partially submerged land like Norway. The relation between the river courses and the meteorology strikes me as important, particularly as bearing on the antiquity of the existing conditions. But, I suppose, allowing for expansion and contraction of the trade-wind belts (and, of course, others relating to them) and for important local interferences owing to geographical changes, the general arrangement of aërial currents on the globe must have been constant from the first.

HYDROGRAPHY OF THE NILE.

Sir William Garstin's Report* on the Basin of the Upper Nile, which supplements, and in part supersedes, his previous Report—Egypt (No. 2), 1901—is perhaps the most sumptuous and attractive Blue Book ever issued from the Foreign Office, and is a highly creditable production of the Egyptian Ministry of Public Works. Invaluable to geographers, it constitutes the standard work on the hydrology of the Nile, whilst the chapter on river-discharges contains fuller information on this subject than has ever before been published. These Reports cover five years' consecutive observations on the Bahr el-Gebel; and although there are no levelled altitudes between the Victoria Nyanza and Khartum (the Upper Nile basin, properly so called, or region of tributaries, all of which are included with the exception of the Atbara, which is not a permanent stream), the barometric and hypsometric observations furnish an approximate determination of the relief of the country. Incidentally, a good deal of geographical information is admirably summarized, the most recent reports having been collated with the observations of the pioneer travellers—particularly with those of Dr. R. W. Felkin, whose work has not previously been adequately recognized. There is, however, the usual inconsistencies in the spelling of place-names; and this is to be regretted, no less than the absence of an index.

In regard to purely geographical questions, it is interesting to note that Sir William Garstin recognizes the river Kagera as the real source-stream of the Nile, if any of the feeders of the Victoria Nyanza be selected as such, but rightly insists that the lake-reservoir itself is the true source. As to whether the shrinkage of the Victoria Nyanza be due to natural causes (as in the Albertine lakes) or to a diminished rainfall, Sir William leaves this as more or less an open question, but hazards the suggestion that, if there be a permanent fall in the lake-level, "it can only be accounted for, either by a general reduction in the annual rainfall, or by a lowering of the bar at the Ripon Falls," although "a careful examination of the last-named site showed no sign of any degradation of this ridge" (p. 28) In fact, the water-action on this hard and compact barrier is very slow, and can in no wise account for the shrinkage of the lake within the last twenty to thirty years. "It is difficult, then," says Sir William Garstin, "not to arrive at the conclusion that this fall is not a permanent one, and will, should another period of heavy rainfall set in, disappear, and the lake rise to its former level" (p. 28). The maximum annual oscillation of the lake is from 1 to 3 feet.

The most interesting section of the Report, to which the reader will naturally turn first, is that dealing with irrigational projects in the basin of the Upper Nile, together with Mr. Dupuis' Report on Lake Tsana and the rivers of the Eastern Sudan. The observations of the pioneer travellers, even when collated by an hydraulic engineer, were, and are, wholly inadequate to throw light on the important question of the relations between the Equatorial lakes and the volume of the Upper Nile; but the systematic observations made since 1900–1901 have materially added to our knowledge of the hydrology of the river.

"The problems to be investigated," says Sir William Garstin, "have two main objects, namely, that of increasing the water-supply of Egypt in the summer, and

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* 'Report upon the Basin of the Upper Nile, with proposals for the improvement of that river.' By Sir William Garstin, G.C.M.G., Under-Secretary of State for Public Works in Egypt. With Illustrations, Appendices, and Maps. Cairo: National Printing Department. 1904. [Issued also as a Blue Book: Egypt, No. 2, 1904.]

that of securing similar advantages to the Sudan during the same period. . . . The best way in which to secure the results aimed at would appear to be to reserve the waters of the Blue Nile for the improvement of the countries bordering that river, while Egypt and the area of the Nile lying to the north of Khartum shall derive their summer supply from the sister river" (p. 172). In the two months of low discharge, the Nile reservoirs are the sole sources of supply. "The objection to any proposals for augmenting the discharge from the Equatorial lakes is that, under present conditions, the increased volume would never reach the White Nile, but would be entirely wasted in the marshes through which the Bahr el-Gebel passes . . . Barely 50 per cent. of the water which now leaves the Albert lake in summer ever arrives at the White Nile, while in the flood the proportion of loss is very much greater. . . . Until, then, some means have been found whereby the water passing Lado during the dry season of the year can be brought down to Khartum in undiminished volume, it is needless to consider the question of any regulation of the Albert and the Victoria lakes" (p. 174). Thus it will be seen that it is important to preserve the regulating power of the marshes (Bahr el-Gebel) for the flood water, and at the same time to find some means of preventing the present wastage in the river during the dry season. It is therefore proposed, as an ideal of perfection, to construct an entirely new channel for the Bahr el-Gebel, which, if the levels and the country permit, would improve the river to a much greater extent than merely remodelling one or other of the existing channels. This artificial channel would not be much larger than one of the great canals in Egypt; and it would, if feasible, follow a north-and-south alignment from Bor to the Sobat confluence—a distance of 340 kilometres. Although the Bahr el-Zaraf (650 kilometres) is a better channel than that of the Bahr el-Gebel (710 kilometres) for delivering the summer supply, the direct route would be by far the best, and, in spite of the greater cost, it would be easier and quicker to construct, besides being a boon to navigation (unless the slope be too great) and cheaper to maintain. Moreover, it would be the true complement of the lake-reservoirs scheme.

The best site for a regulator to the Albert lake is at the fifteenth kilometre downstream of the outlet, where high land borders the river-channel on both sides; and the natural site for a regulating work at the outlet of the Victoria lake is, of course, at the Ripon Falls. Apart from remoteness and consequent cost, there would be no difficulty in constructing either of these works, the engineering obstacles being less than at Aswan. It is interesting, too, in this connection to note that Sir William Garstin endorses Sir W. Willcocks' suggestion, that the best plan would be to cut down or lower the crest of the Ripon Falls instead of attempting to raise the lake-surface; but, he adds, this would involve embanking the river (*thalweg*) in its course through Lake Chogo (80 kilometres). On the other hand, the effect of closing the Ripon Falls by a regulator, and thus possibly raising the level of the lake, would be that the supply would be entirely cut off during at least three years, which, it is estimated, would be needful to raise the lake-level by one metre.

The ideal project of constructing a regulator at the outlet of Lake Tsana, whereby this lake would be converted into a storage reservoir of adequate capacity, must be dismissed for political reasons. If this natural reservoir could be used, it would be necessary only to construct a system of weirs in the river-bed of the Blue Nile between Rosaires and Khartum, with canals taking off above them on either side, n order to ensure the water-supply for *Sefi* cultivation in the Ghezira and Eastern provinces. Outside of Abyssinian territory, a site might be found between Famaka and Rosaires for a dam and reservoir of moderate storage capacity, which would supplement the winter-supply in the Blue Nile. During the winter months the

supply of water for Egypt is ample, and the Blue Nile could be safely drawn upon for local needs. The construction of a reservoir, though of limited storage capacity, south of Rosaires, would materially assist in augmenting the winter discharge of the Blue Nile; and a beginning might be made in the irrigation of the northern portion of the Ghezira, particularly to the north of Wad Medani. But the projects of constructing a barrage on the Blue Nile, for controlling the river Gash, and for obtaining additional supplies from the rivers Dinder, Rahad, Settit, and Atbara, have yet to be studied, and a series of levels run, before any definite schemes can be formulated.

In Appendix I. Sir William Garstin enumerates the following works, which deserve special attention:—

(1) The remodelling of the Bahr el-Gebel.
(2) The construction of a barrage in the Blue Nile.
(3) A canal system in the Ghezira in connection with this barrage.
(4) The regulation of the river Gash.
(5) The construction of a storage reservoir somewhere in Sudan territory, south of Rosaires.
(6) The regulation of the Victoria and Albert lakes.

"Of these," he says, "the first and last will be undertaken more in the interests of Egypt than of the Sudan, except as regards the Nile valley north of Khartum. The others are designed for the benefit of the Sudan alone." From Khartum to Berber the conditions are quite different to those on the Blue Nile, and resemble those of Upper Egypt and Dongola. In regard to Egypt, more particularly, none of these schemes are of extreme urgency except the provision of escape power for the Nile during an exceptional flood. Sir William Willcocks' suggestions and proposals in this respect are dealt with in Appendix I. under the following heads: (1) the raising of the Aswan dam; (2) the utilization of the Wadi Rayan depression as a secondary reservoir; and (3) the remodelling of the Rosetta branch of the Nile. The combination of the first two schemes, making the one the complement of the other, is an entirely novel idea, and a striking instance of the high capacity of its author; but space precludes our dealing with these technical matters, as well as with the indeterminable question of cost.

A. S. W.

THE FRENCH CONQUEST OF THE CANARIES IN 1402–6, AND THE AUTHORITY FOR THE SAME.

By C. RAYMOND BEAZLEY, M.A.

The French conquest of the Canaries, at the beginning of the fifteenth century, that first chapter of modern colonial history, has long been considered to rest upon an authority ('Le Canarien') of exceptional value, being not only a contemporary witness, but written by men who were present at, and took part in, the events here recorded with such a wealth of life-like and picturesque detail. And in many respects this view is correct enough. For the *Livre de la Conqueste et Conversion des Canariens . . . en* 1402 . . . *par Jean de Béthencourt . . . composé par Pierre Bontier* (sic), *moyne de S. Jouin de Marnes, el Jehan le Verrier, prestre séculier, chapelains du dix seigneur*, printed by Pierre Bergeron in 1630, collated by d'Avezac with the Mont Ruffet manuscript of c. A.D. 1482 (from which Bergeron seems to have worked, and which Charton used for his 'Voyageurs anciens et modernes' of 1855), is, after all, one form of the original record of this Norman conquest in the Atlantic. It is also, combined with the results of d'Avezac's collation of the

manuscript aforesaid, the form reproduced and translated by Major in 1872 for the Hakluyt Society; in other words, the standard form for English scholars of the last generation. But it is not the most original, nor the most trustworthy form; for the history of the French expedition to the Fortunate islands is here revised to suit the views of the Béthencourt family. It therefore magnifies the figure of Jean de Béthencourt, depreciates the achievements and importance of his colleague, Gadifer de la Sale (or Salle), and combines the original narrative of Pierre Boutier the Benedictine and Jean le Verrier the secular priest, with additions of various kinds, such as the last twenty-five chapters of Major's edition, following upon the description of the Canary islands (Hak. Soc. edition, pp. 140–220). Its representation of many incidents is totally different from that of the primitive Record lately rediscovered, where the writers' sympathies are clearly with Gadifer, and where Jean de Béthencourt is unsparingly criticized—not in reference to his treatment of his wife, as in the later Redaction, but in regard to his conduct in the joint leadership of the Canary conquest. Gadifer de la Salle, through the words of his chaplain and advocate, Pierre Boutier, has once more, after the silence of centuries, made himself heard. The acquisition of the Egerton manuscript No. 2709 by the British Museum in 1888 has produced this result. The manuscript in question, formerly in the possession of the Baroness de Hensch de Langry, is of much earlier date than that from which Bergeron, Charton, d'Avezac, and Major worked; it belongs to the first quarter of the fifteenth century (*c.* A.D. 1420); it contains a reference to the Papal schism ended in 1429 (fol. 29*b*, "nous auons deux papez," etc.); it is usually composed in the first person plural, and not, like the text of 1482, in the third person; and it unquestionably represents an older (probably the very earliest) form of the conquest narrative. It implicitly contradicts the tradition that Jean le Verrier dictated to Pierre Boutier the record to which these two ecclesiastics jointly set their names. It makes clear that the two ecclesiastics aforesaid were not, as suggested by the later text, both chaplains of Béthencourt, but that Boutier was the spiritual attendant of Gadifer. Finally, as already noticed, it furnishes Gadifer's statement of the whole episode of the Canarian invasion, and supplies a number of detailed accusations of inefficiency, slackness, disingenuousness, fussy assumption of superiority, and the like, against Jean de Béthencourt.

This Egerton manuscript, henceforth its primary authority for the French conquest of the Canaries and the first extension of European influence to the Atlantic islands, before its acquisition by the British Museum, had remained wholly without notice or collation; a short but excellent description of it is given in the 'Catalogue of Additions to B. Mus. MSS.,' 1888-93, and a transcript of it was made by Miss Lucy Toulmin Smith for M. Pierre Margry and printed (unfortunately with many mis-readings) in the latter's 'Conquête . . . des . . . Canaries,' 1896. But no one has yet made an adequate comparison of this text with that given by Major and d'Avezac, although the main features of difference have been already pointed out both by the Museum 'Catalogue of Additions' above quoted by Margry. It may, therefore, be of use, by certain select examples, to warn English students who may touch on, or in any way interest themselves in this fascinating chapter in the History of Exploration, that the old standard text, given to them and translated for them in the Hakluyt Society's publications, can no longer be taken as sufficient. Here and there it adds points not in the Egerton manuscript, but (within the period common to both) it omits far more important matters represented only in the latter. And among these we have first and foremost the matter of the chief credit and honour. In Major's text these are almost wholly due to Béthencourt; in Egerton they are mainly Gadifer's.

To show how important are the modifications now introduced into the received account, it will be enough to compare the more interesting variants of the preface and the first nine chapters.

At the beginning, the 'Livre nomme *le Canarien*' speaks of the present Norman conquest of the Canary isles (*qui se dient les Isles de Canare*) as parallel to the Christian conquests of heathen lands in olden time. Here both texts agree; but whereas in that of Major Béthencourt only is named as leading the enterprise, in Egerton Gadifer is not merely mentioned but placed first. Thus—

MAJOR.

". . . Jean de Bethencourt, Chevalier, né du Royaume de France eut entreprins ce voyage . . . au soustenement . . . de nostre foy . . . en certaines Isles qui sont sur celle bende, qui se dient les Isles de Canare" [p. 1, Hak. Soc.].

EGERTON.

"*Gadifer de la Sale et* Jehan de Bethencourt, *Chevaliers, nez* du Royaume de France, *ont* entre*pris* ce voyage . . . *du soustenement** . . . de ūre sainte creance . . . en certaines Isles qui sont sur celle bande, qui se dient les Isles de Canar*ie*." [Preface fol.]

The authors' introduction of themselves to their readers is also very different in the two texts.

Thus Major reads—

"Et nous Frere Pierre Bontier moine de Sainct Jouin de Marnes, et Jean le Verrier, prestre, et seruiteurs du dit de Bethencourt dessus nommé, auons commencé à mettre en escrit le plus des choses qui luy sont aduenues . . . et . . . la maniere de son gouuernement . . . dès ce qui se partit . . . de France iusques au 19 iour d'Auril 1406."

While Egerton has—

"Et nous Frere Pierre Boutier moyne de Saint-Jouyn de Marnes et Mons.* Jehan le Verrier, prebstres,* *Chapellains et serviteurs des Chevaliers desus nōmes* avons cōmancié a mettre en escript *toutez* les choses qui *leur* sont advenues . . . et . . . la maniere de *leur* gouvernement . . . des ce qu'ilz *partirent* . . . de France iusques au xix^{e} iour d'Auvril *mil iiij^{c} et iiij* (i.e. *1404*)."

Once more, at the end of the Preface, Egerton adds the following important particulars about Béthencourt, which, however honourable in themselves, were evidently unpalatable, and so deleted in the revised text:—

Et veu que Bettencourt en fait d'armes aet perdu la force et la vertu d'aucuns de ses membrez, on li deveroit bien tenir à grant honeur* [with three more lines of double-edged praise, all carefully removed from the text of 1482].

Again, when the narrative proper at last begins—

Major's text "makes mention"—

"de l'entreprise que Bethencourt, Chevalier et Baron, né du Royaume de France en Normandie,* lequel . . . se partit de son hostel de Grainuille la Taincturiere en Caulx, et s'en vint à la Rochelle et là trouua Gadifer [with ten more lines describing how Béthencourt *persuaded Gadifer to join him*, and so made his *accidental* meeting the foundation of his enterprise]."

But Egerton simply speaks—

"de l'emprinse* que *Gadifer de la Sale et* Bethencourt, cheualiers,* *nez* du Royaume de France, *l'un Poytevin du pais de Touarsois*, l'autre Normant du pays de Caux, ont * [after which a lacuna of a few words' space] cōmence a mettre en escript les choses qui *leur* sōt avenues, des qu'ilz partirent de *leurs* nacions et pensons a poursuir ūre escripture iusque a la fin de *leur* conqueste . . ."

* The main verb is wanting in both texts.

Again, when on their way, the French squadron gets into a dispute with the Seigneur de Hely at Corunna, it is in Egerton, not Béthencourt, but Gadifer, who offers the restoration of the boat and anchor, which the Seigneur claimed ('Quand *Gadifer* vit cela, it dist au Sire de Heli,' etc., chap. 1 Eg.). Similarly in Spain, when the Frenchmen are accused of piracy by the merchants of Genoa, England, and Piacenza resident at Seville, it is in Major Béthencourt—in Egerton Gadifer—who lands ("sy descendi *Gadifer* a terre," etc., Eg. chap. 3). In the same way, it is Béthencourt (in Egerton) who weakly proposes—"*ie ne sçay a quelle fin*"—to compromise with the mutinous crews at Seville, Gadifer who dissuades from folly (this incident is entirely wanting in Major's text); it is Gadifer who first lands in Lançarote ("l'isle *Lancelot*"). While as to the submission of the native king and the first fortifications and military arrangements in Lançarote, the two texts again vary with the old significance—

MAJOR.

"Le Roy du pays viendroit parler à M. de Bethencourt, en la presence de Gadifer . . . et se vint ledit Roy en l'obeissance dudit Bethencourt. . . . Et demourèrent ledit Roy Sarrasin et M. de Bethencourt d'accord, et fit faire le dit Sieur de Bethencourt vn chastel, qui s'appelle Rubicon. Et laissa M. de Bethencourt vne partie de sa compagnie . . . semblant au dit de Bethencourt qu'un . . . Berthin de Berneval," etc. (Major, p. 10).

EGERTON.

"Le Roy viendroit en certain lieu et ainsi fu il *car Gadifer, ne vouloit mie faire nul accord à euls sans Bettencourt* . . . et se mistrent à l'amistance *des Chevaliers des susdits. . . . Mais Bettencourt en a depuis mal fait son devoir*, ainsi que vous verrez un pou cy apres Et demourerent *euls et ceuls de l'isle Lancelot* en bon accord. Apres *commencerent* un chastel qui s'appelle *Rubicum*. Et laisserent la une partie et *leurs* gens; et *leur* semblant que Bertin de Berneval," etc. (chap. 4 Eg.).

Once more, in Major, Béthencourt advises with Gadifer for a night expedition against Fuerteventura; in Egerton, it is simply—

"*se parti Gadifer et Remõnet de Leuedan avecquez une partie* . . . (chap. 5 Eg.)

And last among these examples we may notice how in chapter 7 (Eg.) Béthencourt's return to Spain to procure reinforcements and provisions is denounced in the primitive text as a deception—"*mais il en a fait tout le contraire, ainsi qu'il est escript en ce livre, plus a plain;*" how in chapter 8 (Eg.; 24 in Major) Béthencourt is blamed for the loss of the ship ("*par faulte de bon gouvernement et de bonne ordonnãce*"); and how in the latter part of the same chapter, as well as in chapter 9 (Eg.; answering to chapters 25 and 26 in Major), he is accused of taking no proper measures for the relief of Gadifer ("*ni mist onques autre remede, ains demõra sãs autre chose en ordenner*"), of neglecting to profit by any warnings of his friends' distress ("*mais il n'en fist compte*"), of taking but a slight part in the venture, of swaggering about at the Court of Castille, of posing as "Lord of the Canaries," and of turning things to his own selfish profit ("*aucunes choses qui sont venus au prouffit de Bettencourt, bien a la value de V. c doubles d'or, selon ce que on dit a Siuile . . . et s'appela la* Seigneur des Isles de Canare, combien qu'il y' a pou travaille et mis du sien, especialement en la conqueste, car il n'y a eu que trois de ses gens . . . et impetra du roy* [de Castille] *le quart de toutes les marchandises qui viendroient des isles, sans faire mencion de son compaignon*"). In most of these citations from

* At the court of Castille.

the Egerton text it will be evident, to any one who compares the same with Margry's readings, that the latter are far from giving the manuscript exactly. Thus *soustement* for *soustenement*, *nous* for *Mons.*, *prebstre* for *prebstres*, *avoit* for *aet*, *Gadifer . . . et Bethencourt* for *Gadifer . . . et Bettencourt cheualiers*, *enprinse* for *emprinse*—all starred passages—are instances to the point in the preface and first chapter alone.

REVIEWS.

EUROPE.

Russian Lapland.

'Three Summers among the Birds of Russian Lapland.' By Henry J. Pearson. With History of St. Triphon's Monastery and Appendices. London: R. H. Porter, 1904. Size 9½ × 7½, pp. xvi. and 216. *Maps and Illustrations. Price* 20*s. net. Presented by the Author.*

This well-printed and profusely illustrated work is the successor to the author's 'Beyond Petsora Eastward,' which was noticed in this Journal for 1900 (vol. 1, p. 189). The district now described is the portion of the Murman coast which lies between the mouth of the Pechenga river (say 70° N. lat.) and Lutni, the latter behind the promontory of Sviatoi-Nos, in lat. 68°. From Lutni, which Mr. Pearson had visited in 1895, he steamed eastward, across the throat of the White sea, to the Kanin peninsula, and found a landing-place somewhere to the southward of Cape Kanin. No inhabitants were met with, but there was a house and also a chapel, and the place is conjectured to be on the river which is named Bogrametza in Imray's chart of 1895. In general character the valley resembled Kolguev island, previously visited, and one of the photographs gives an idea of the thousands of tons of driftwood to be seen on the shore. Attempts were made to find a landing-place further south, but in vain, owing to fog and surf, so a return was made to Lutni. On all three occasions the summers were cold and backward, the worst being in 1899, when the valley of the Pechenga was ascended and the monastery of Saint Triphon visited. Of this establishment and the beneficial influence exercised on the peasants by the monks, Mr. Pearson speaks in high terms. On the third expedition the gulf and river of Kola were ascended to Lake Imandra; it was not necessary to cross the peninsula and come out at the Gulf of Kandalax, because that district had recently been explored, from the ornithological point of view. For bird-nesting was the main object of these trips, but the narrative affords very good reading; while an Appendix, in which lists are given of the requisite stores and clothes, cannot fail to be useful to future travellers. The map is adapted from one published more than a quarter of a century ago by Prof. J. A. Friis.

H. S.

Germany in the Middle Ages.

'Historische Geographie Deutschlands in Mittelalter.' Von Dr. Bodo Knüll. Breslau: 1903.

The inspiration of the present work has been Wimmer's 'Historische Landschaftskunde' (Innsbruck: 1885), and a very fortunate inspiration it has been. Admirably clear in statement, and careful in research, Dr. Knüll's essay deserves to be expanded into a treatise of much greater length. The author begins with a study of the changes in Central European natural features,

directing attention especially to the Baltic and North sea coasts, the rivers, and the lakes. He next examines the changes in the human element ("Der Weschsel der Bewohner") during four great historical periods—before and during the *Völkerwanderung*, from the *Völkerwanderung* down to the close of the Karling Age, and from the accession of the Saxon Dynasty to the close of the Middle Ages. Thirdly, the settlement of the various German districts—including the Swiss and Austrian German lands—is reviewed with great care, under the periods roughly corresponding to those already indicated ("bis zur Volkerwanderung," "von der Zeit der Volkerwanderung bis auf Karl den Grossen," "seit der Zeit Karl des Grossen"), and with special reference to (1) the North-West Lowlands, (2) the Central Highlands and the Alps, (3) the Eastern semi-Slavonic regions. Considerable attention is also devoted to the variations in animal and plant life in the Germany of the Middle Ages; to the mediæval discovery and exploitation of mineral deposits, and especially of gold, silver, iron, and coal; to the Keltic, Roman, Slavonic, and German methods of colonization and cultivation; to the gradual civilization of the settled territory by towns and townships, by monasteries, by roads and bridges, by markets and commerce; to the various types of architecture, religious, military, feudal, and domestic. While, in conclusion, an historical summary of German progress from the first century before Christ to the end of the Middle Ages, enables the author to gather up in a few pages the chief lessons of his work. The evidences of the survival of Roman civilization in certain districts, the indications of progress afforded by local municipal history, the civilizing work of the great monasteries, the history of the leading trade-routes and trade-centres—none of these are neglected, and the result is a valuable introduction to the history of Germanic civilization; in distinction from Germanic wars and dynastic annals, during the time of the making of our modern world. C. R. B.

Survey Atlas of England and Wales.

'The Survey Atlas of England and Wales.' A series of eighty-four plates of Maps, and plans, with Descriptive Text, illustrating the Topography, Physiography, Geology, Climate, and the Political and Commercial Features of the Country. Designed by and prepared under the direction of J. G. Bartholomew, F.R.S.E., F.R.G.S. Edinburgh: John Bartholomew & Co. 1903. *Price* £2 12*s.* 6*d.*

The Survey Atlas of England and Wales is now completed, and Mr. Bartholomew may be congratulated upon bringing to a most successful termination the task upon which he has been engaged for over ten years. He has produced an atlas of which he may well be proud, and with which our Society, under whose patronage it has been published, has no reason to regret that it has been associated.

The task has been of great magnitude, and one which has never been seriously attempted before, involving nothing less than a complete series of maps of the whole country, on the scale of 2 miles to an inch, reduced from the Ordnance Survey, Admiralty Charts, and other sources. This alone has been a colossal undertaking; but in addition, the early part of the atlas consists of an excellent set of physical and statistical maps and tables prepared from the latest reports and Government returns, the results of which are now for the first time presented in a graphic form.

The atlas has been published in monthly parts, the first of which appeared early in 1903; but years before this the preparation of the maps was taken in hand, and the 2-miles-to-an-inch sheets, with their orographical tinting, had been issued separately, and had established for themselves an excellent reputation, especially

amongst tourists and cyclists. These sheets, which form the principal part of the atlas, have been carefully reduced from the Ordnance Survey, by special permission, and before publication in the atlas, have been submitted to local authorities and others for revision and correction, to bring them as far as possible up to date. They are altogether sixty-seven in number, and cover the whole country. Each one includes an area of about 1270 square miles, and measures 15½ inches by 20½ inches. The nomenclature has received particular attention, and the selection of the names from the Ordnance Survey sheets has been made with evident discretion and care. It would be too much to expect that a work of such magnitude should be altogether free from errors, but these are few and far between.

The special feature of these maps is their orographical tinting, by means of which a general idea of the elevation of the land in any part can be obtained at a glance. The selection of the tints has been a matter of great consideration. The tints finally chosen are altogether eighteen in number. First there are four shades of green at intervals of 100 feet, then follow tints of burnt sienna and brown up to 2750 feet, increasing in density with the altitude. The first four of these are at 200 feet, and the remainder at 250 feet intervals. Finally there are, for those few areas where the altitude exceeds 2750 feet, two shades of purple, which hardly appear in character with the rest of the shading. For the purpose in view, the tints of brown leave little to be desired, and they blend well with each other; but the transition from the shades of green for the lower districts to those of brown is necessarily abrupt, and it would have been better if it could have been managed to have had shades of one colour throughout, though this in actual practice may be difficult.

Among the smaller-scale general maps in the first part of the atlas, there are some that are worthy of special attention, such as the Bathy-Orographical Map of England and Wales with the new physical nomenclature as approved by the Council of the Royal Geographical Society; the Geological Map, with an inset showing the distribution of coal and iron, and another of the geology of the environs of London; maps showing density of population; an extremely useful little series of meteorological maps; commercial and industrial maps, and several others.

The atlas opens with several pages of letterpress of a general and statistical nature, commencing with a description of "The Physical Features of England and Wales in Relation to Political and Commercial Development," by Dr. H. R. Mill. Then follow a brief account of the geological features by Sir Archibald Geikie, tables of mean monthly and annual temperatures of one hundred and ten stations of England and Wales by Dr. A. Buchan, tables of rainfall, agricultural, population, ecclesiastical, parliamentary, railway, commercial, and other statistics. These are followed by a most useful table giving the etymology of English and Welsh names, and finally a list of maps of England and Wales from the earliest times, in chronological order. Although it is not pretended that this list is complete, yet it is fairly full, and will be useful for reference.

Instead of an index, Mr. Bartholomew has published simultaneously a Survey Gazetteer of England and Wales, which serves all the purposes of an index, and gives a good deal more information than could be included in an index.

In conclusion, it must be admitted that by the publication of his 'Survey Atlas of England and Wales,' Mr. Bartholomew has rendered a great public service, and has done much, with previous similar work, to raise the standard of British cartography. The atlas will be of the greatest utility for many purposes.

E. A. R.

ASIA.

TIBET.

'Il Tibet (Geografia, Storia, Religione, Costumi) secondo la Relazione del viaggio del P. Ippolito Desideri (1715–1721).' By Carlo Puini. Rome: 1904. lxiv. + 402 pp.

As stated in Sir C. Markham's 'Narrative of the Mission of George Bogle to Tibet,' etc., the long-forgotten MS. of the Jesuit Father Desideri's 'Ragguaglio' was rediscovered at Pistoia in 1875 by the distinguished orientalist, Prof. Carlo Puini, who at once proposed to publish the valuable document, with all necessary notes and illustrations. But the owner, Cavaliere Rossi-Cassigoli, refused his consent, preferring to yield all rights "for a consideration" to the Hakluyt Society, which had offered to bring out an English edition. This project, however, also fell through, owing apparently to the death of the owner, and no further action was taken till the year 1901, when the proffered aid of the Italian Geographical Society enabled Puini to carry out his original design in a modified form. What he has now issued is by no means a complete edition of the 'Ragguaglio,' which contains a comprehensive account of the author's travels and missionary work in Persia, Kashmir, the Moghul empire, Little and Great Tibet, and the capital Lhasa, where he resided for six years (1715 to 1721), that is, far longer than any other European before or since his time. Puini's work is entirely confined to the Tibetan section, which forms little more than half, though certainly by far the most valuable half, of the MS. Even this section is not given in full, but edited on a sort of eclectic system, which perhaps need not be regretted, seeing that it abounds in needless repetitions, is written in a somewhat prolix and inflated style, and put together in a confused way without any chapter or other sectional divisions except quite towards the end. These are now supplied by the editor, who also gives a brief notice of Desideri's predecessors and immediate successors in Lhasa, a summary of his travels in the East, five of his letters written during his stay in Tibet, a geographical survey of that region, and an appendix containing a history of political events brought down to the eve of the recent British expedition to Lhasa. There are indexes of Tibetan and Sanskrit words, with a scheme of Tibetan transliteration, and a general subject-index.

The text itself, or such portions of it as are here produced, the editor has supplemented, not only with numerous explanatory notes, but also with lengthy intercalated comments, which, coming from such a high authority on Tibetan subjects, have a distinct value of their own. Unfortunately, they are at times introduced in such a way that it is not always easy to distinguish between Desideri's language and Puini's comments. The difficulty, however, will scarcely be felt by those able to appreciate the difference between the literary tone of present and early eighteenth-century Italian, even though the orthography has been made conformable to present usage. This conformity was doubtless necessitated by the fact that the MS. is evidently in three different contemporary hands, one of which appears to be that of a somewhat ignorant scribe writing from dictation.

But if the document may seem to be somewhat over-edited, the student will still be grateful to Prof. Puini for his careful treatment of the parts dealing with Tibetan Buddhism and Lamaism, to which over a third of the volume is devoted. The geography and history of the country, the usages, social and political institutions of the people, are now fairly well understood. But much light is still needed for the elucidation of their strange religious systems—the primitive Shamanism, the later Bonboism, the historic Buddhism and Lamaism—all superimposed one on the other, and arresting the normal progress of the nation for ages. Such light

can be looked for only from those rare scholars who, like Csoma de Körös, Rockhill, Desideri, and Puini, possess a thorough knowledge of the difficult Tibetan language and its voluminous Buddhist writings. Hence, pending a complete edition of Desideri, Puini has made a valuable contribution to the study of Tibetan and other primitive religions by the numerous critical remarks with which he has accompanied his copious extracts from the 'Ragguaglio.'

A. H. Keane.

'Tibet.' By Dr. Georg Wegener. Halle: 1904. Pp. 147. *With Maps.*

Dr. Wegener puts forward an excellent handbook to Tibet, embodying the most familiar results of the recent development of acquaintance with that country. He deals first with the history of the name, the boundaries and extent of the country, and the slow and interesting growth of knowledge concerning it. Its physical features, climate and inhabitants, trade-routes and trade, are then treated; finally, chapters are devoted to Lhasa, to political history, and to relations with England. A comprehensive list of authorities to which reference has been made completes the work. Sheet 62 of the new Stieler Atlas (Inner Asia) is included in the book, and there are uncoloured plans of the route taken by the English expedition of Lhasa, and of the relationship of the country with the main waterways of Southern Asia. The illustrations are such as have recently appeared in the illustrated press of this country; in fact, to that medium the dissemination of such knowledge as that to which this book is an introduction, is mainly left in England. It is, however, within the scope of a monograph of this sort to improve upon the better class of newspaper article, by giving a scientific arrangement and such additional facts as a list of authorities, and it is to be hoped that in the future the necessity to supply a demand for such short treatises will arise in this country. The present short work would serve as an excellent model. It is well arranged and well printed, lacking only an index or detailed synopsis.

Asiatic Turkey.

'Dar-ul-Islam.' By Mark Sykes. Bickers. 1904. Pp. xxiii., 294. *With Maps.*

Into a curious and not wholly pleasing medley of humour, anecdote, moral and political reflection, and description of travel, Captain Sykes incorporated a certain amount of valuable geographical matter. He ranges from Damascus to Tiflis, and from Constantinople to the Tigris. Mainly in the districts north of Aleppo, he provides certain sectional route-maps, showing his road, with rough hill-shading and elevations, salient buildings, and other features. They are designated as sketches not absolutely accurate, and are not on a uniform scale or in a uniform style, but they are clear, and, taken together with his excellent photographs, instructive. Illuminating descriptions of some of the places visited are given, and into some of the jocose native character-studies it is possible to read an ethnological interest. The book would be worth the attention of casual travellers in Captain Sykes' tracks, and it may be noted further, that he indicates several sites which are apparently awaiting the researches of archæologists. One section at least of Captain Sykes' journey was probably more remarkable than his narrative makes it appear, for he travelled in the Taurus for a month in winter, and the slight indications of the difficult and even dangerous conditions he met with in snow and storm induce a certain regret of the absence of meteorological observations from his wide range of subject-matter.

Siberia.

'Through the Highlands of Siberia.' By Major H. G. C. Swayne, R.E. Rowland Ward. 1904. Pp. xiv., 259.

In June, July, and August, 1903, Major Swayne made a sporting trip in the mountainous district on the Russo-Chinese border, about the valley of the Chuya, a headstream of the Katun, which joins the Ob. His hunting-ground of *Ovis Ammon* lay in the short ranges north of, and roughly parallel to, the western end of the Altai. Judging from his records, he may be congratulated on successfully accomplishing his purpose. He has also produced a book which not only gives a well-defined picture of the magnificent country which was his goal, but also contains many interesting impressions of that part of Siberia through which he travelled on the great railway and to the south of it. There is, probably, no more dangerous comparison to be made than one between the physical characteristics of the two widely different countries, but Major Swayne paints his picture of middle Siberia in summer, for example, by means of allusions to its likeness to an English countryside, and so the land is made to appear vividly to the eye. Nor are there wanting astute observations as to the methods of Russian expansion, its geographical limits, and the reasons why these will not, in his opinion, be overstepped. As regards strictly geographical interests, this, the first part of the work, is of the greatest value. The excellent illustrations, however, maintain these interests throughout; for the book is produced in the luxurious style commonly associated with Mr. Rowland Ward's sporting publications.

Eastern Siberia.

'Glavnyeshiya Danniya po Statistik Naseleniya kranavo Vostoka Sibiri—Primorskaya i Amurskaya i Ostrof Sakhalin.' 1903. Published by the Statistical Committee of the Home Ministry.

In this volume M. S. Patkanof has collected statistical information concerning the population of the Amur and Maritime provinces and Sakhalin, and on the occupation of the inhabitants, with some ethnological notes, etc. Much of the information is not new. It is well known that colonization in the far east of Siberia, at any rate with the exception of the Ussuri districts, has not been attended with much success. One necessity is that Europeans should be able to multiply in these cold regions. As regards the Amur, the climate does not appear to have a disastrous effect on human life; seventy-seven persons have attained the age of ninety, of whom seven have lived to be more than a hundred, and the increase of population due to the excess of births over deaths is about 1·7 per cent. per annum. Agriculture is the chief occupation, 63 per cent. of the total population being engaged in it. Yet corn and cattle to a considerable value are imported from Manchuria. This results from the careless methods employed by the Russian settlers, who have not profited by the example set them by their Chinese and Manchurian neighbours. For cattle the pastures are little suited, and murrain is frequent. Sakhalin is still less prosperous. The natural increase of the population is insignificant, a fact accounted for, at least in part, by the great excess of males over females. The majority of the people are convicts and exiles. Corn yields a small return, and therefore potatoes are more extensively planted. Gold-mining, an important employment in the Amur province, is declining. In Sakhalin about 37,900 tons of coal were mined in 1899, and there is a prospect that gold-mining and the working of petroleum wells will be profitable in the future.

Manchuria.

'Manchu and Muscovite.' By B. L. Putnam Weale. Macmillan. 1904. Pp. xx., 552. *With a Map.*

Mr. Weale deals mainly with Russian misrule in the "railway province." His book was written before the outbreak of the war, but is intended as a statement of the conditions previous and leading to the crisis. By way of introduction, however, he gives a brief sketch of the history of the land now called Manchuria from the earliest times, treating it for this purpose from a right geographical standpoint. Thus he writes in his opening sentence that it must be considered simply as part of the whole area "which, stretching from the oases of what is to-day Eastern Turkestan, spread across the rolling plains and dismal deserts of Mongolia, jumped where is now the Great Wall of China, wound over river, mountain, and dale, and ended only with ice-cold waters of the furthest north-east." As an orographical synopsis, exception might perhaps be taken to this sentence, but the analysis of this great area into its former and existing political parts is most interesting. Coming to Manchuria itself, the reader is left without any very definite pictures of the land; it is, in fact, shown to him, so to say, from the railway-carriage window. The main interest lies in the descriptions of places, from Dalny and Port Arthur to Kharbin, as regards both their appearance and the curious atmosphere of corruption which appears to hang about nearly every walk of life in these Russian towns. The whole narrative can only be criticised as painted in somewhat glaring colours, leaving a certain suspicion of exaggeration through the very fact of the strong sentiment which obviously animates the author, perhaps best illustrated in the dedication "to the gallant Japanese nation." Finally, the general and statistical note on Manchuria, inserted as an appendix, seems rather unfortunately placed; it should surely rank alongside of the historical introduction. From the geographical point of view, it is, in fact, what the reader has been lacking all through the work. The illustrations and map are satisfactory.

AFRICA.

Morocco.

'Trois Mois de Campagne au Maroc.' By Dr. F. Weisgerber. Ernest Leroux. Paris: 1904. Pp. 240.

This work deals with that part of Morocco which extends from the Atlantic seaboard between Rabat and Cape Blanco southward (along the lines of longitude) to the city of Marrakesh, or Morocco, and thus, roughly, between 6° 30′ and 8° 40′ W. and 34° and 31° 30′ N., an area of about 15,000 square miles. The greater part of the book consists of a narrative of the author's journeys in 1897–98, which is of much interest, especially the portion which deals with his sojourn in the huge camp of Sokhrat ed-Jeja ("une immense cité de toile") when the sultan was engaged in person in the drastic "pacification" of the district. The description of his visit to the camp is made the occasion for a valuable review of the conditions and *personnel* of the Government. But the main geographical interest lies in the appendix of 80 pages, devoted to an "étude géographique de la région parcourue," and divided into sections of orography, hydrography, geology, climate, flora, fauna, and people. The district extends from the coast to the Atlas mountains, but does not touch the main range; and is divided into four zones—the coastal belt of the Sahel, widening from east to west from 10 to more than 20 miles; the lower terrace, a bare, very slightly undulating plain ranging from 500 to 800 feet or more in altitude; the upper terrace, of more broken country, where isolated elevations up to, or even exceeding, 3000 feet were observed, and the high plateau, formed

by what may be termed the higher foothills of the Atlas. The coast-line is composed mainly of sandy bluffs, with a low shore broken by lagoons and occasionally by rocky promontories, which partly shelter insignificant bays such as the anchorage at Casablanca. The sands of the coastal belt are continued into the Sahel, where the subsoil is calcareous. The region of the lower terrace is that of the *tirs*, the word signifying "les terres argileuses qui se crevassent en se déssechant." The soil is dark and fertile. The upper terrace, on the other hand, is for the most part arid and sterile, whether consisting of stony, sandy, or clayey tracts. Schists and quartzites are the principal formations of the high plateau. The chief stream of importance is Um Er-Rebia (Morbêa). The maritime climate of the coastal region is described as equable and temperate, though moist, but between the lower and upper terrace a transition takes place, rather suddenly as a rule, to a climate of continental character, dry and less equable. The illustrations in this book are few but good, and the diagrams are simple and clear.

O. J. R. H.

AMERICA.

United States.

'Greater America.' By Archibald R. Colquhoun. Harper Bros. 1904. Pp. x., 436. *With Maps.*

Mr. Colquhoun is deeply versed in large political problems, which he approaches with a proper appreciation of geographical considerations. Not that this volume has any affinity with that class of work which bases political theory on geographical fact, and sometimes tends to outrun actuality in giving rein to imagination. But, on the other hand, geographical facts are not forgotten, as not infrequently in attacking political problems they are forgotten. This book contains a series of simple but clear diagrams illustrating various subjects from racial distribution in the United States to the effect of the Panama canal in creating new world-highways, and each of the subjects thus illustrated is elucidated in the text. The completeness of the work may be shown by a selection of subjects—America's Pacific expansion and Caribbean expansion; Pan-Americanism in its associations with South America and with Canada; the government of "Greater America," and its connection with the problem of expansion at large; and American interests in Asia, which last involve a particularly succinct chapter entitled "Asia and Transformation." As regards the purely political side of the work, no more need be said here than that it gives a remarkably clear conception of the wide and growing ramifications of American interests. There may be noted, however, a few of the incidental sections which give the book a purely geographical interest. The chapters on Caribbean expansion contain a remarkable picture of the contrast between the desirable natural conditions and wholly undesirable human conditions, so to say, in the West Indian islands. Similarly, under the heading of Pan-Americanism in the southern continent each of the South American republics is taken up in turn, its political and economical state discussed, its natural opportunities set forth, and all compared and contrasted. Canada is similarly dealt with; the geographical reasons for her development along latitudinal rather than longitudinal lines, and her ethnological conditions in relationship to their bearing upon her imperial standing are not forgotten. The book is, in short, an application of the best methods of political geography to a special and essentially modern subject.

O. J. R. H.

THE MONTHLY RECORD.

ASIA.

The Name of the Highest Mountain in the World.—An able recapitulation of the various stages in the controversy on this subject, which has been maintained for so many years, was contributed by Major Burrard, of the Indian Survey Department, to *Nature* for November 10 last. Major Burrard appealed to geographers to accept the name Everest for the great mountain in virtue of the prescriptive title it has acquired by its use during a number of years, and the absence of any other generally acceptable designation. A brief reply from Mr. Douglas Freshfield appeared in the same journal for November 24.

Areas in Asiatic Russia.—We learn from our Honorary Corresponding Member, Colonel J. de Shokalsky, that the great work on the areas of river basins and administrative divisions in Asiatic Russia begun by the late General Tillo and continued since his death by Colonel Shokalsky, was about to be printed in December. The method employed in computing the areas is a new one, and of interest from a theoretical point of view. It gives exceedingly accurate results, which, in the case of Asiatic Russia, will be a decided improvement on those hitherto accepted, which have been based on the calculations of the late General Strelbitsky.

The Jarawas of the Andaman Islands.—We have received from Mr. C. G. Rogers, of the Indian Forest Department, a collection of official papers relating to recent journeys in the interior of the South Andaman island, undertaken by himself and other Government officials with a view to ascertaining the position of the settlements of the Jarawas, an aboriginal tribe, which has been much given to raiding the settlements on the coast, several lives having been lost through their means.* It is not quite clear, from the extracts printed, whether the expeditions were undertaken with a view to reprisals, or merely for the purpose of entering into relations with the Jarawas with the object of stopping their raids. On two occasions, however, attempts to capture individuals of the tribe were made, the second of which led to the death of Mr. Vaux, officer in charge of the Andamanese at Port Blair. The first report describes a reconnaissance made by this officer and Mr. Bonig, assistant harbour-master at Port Blair (in part in company with Mr. Rogers), in January and the early part of February, 1902. Proceeding to the west coast, north of Port Campbell, the party went inland through dense jungle and up the courses of mountain streams blocked by slippery rocks, but though one or two recently-occupied hunting camps of the Jarawas were discovered, none of the people were met with, although a small party came down to the beach in view of the launch during the leader's absence. The next attempt was made from Port Anson, the inlet leading from the west towards the Middle strait, and resulted in the discovery of one of the permanent settlements of the Jarawas, who were, however, away at the time. The hut was a substantial building measuring 60 feet by 40, and supported in the centre by seven stout posts 25 feet high, and it contained various utensils—honey and water vessels, baskets, mats, bows, etc. In the centre was the main fireplace, and round the sides the smaller fireplaces used by the separate families. The house was large enough to contain eighty to a hundred people, and the Andamanese state that the whole tribe collects into one such house

* An incident illustrating the irreconcilable character of the Jarawas, and their ignorance of the powers of the White man, is related in Mr. Kloss's recent work on the Andamans and Nicobars (p. 191).

(of the two or three which seem to exist altogether) during the rains, but Mr. Vaux considered this doubtful, as the men alone number, in his opinion, from eighty to a hundred. The house was placed on the summit of a hill, with paths leading up to it, the main approach being as well cleared as a Forest Department road. The next report is one by Mr. Rogers on a journey inland from the east coast, across the series of ridges running from north to south, which he thinks must number something like twenty. A large number of running streams of delicious water were crossed, and both Mr. Vaux and Mr. Rogers express the opinion that want of water cannot be the cause of the Jarawa raids, as has sometimes been thought. The forest was generally poor, consisting of small trees with a densely matted undergrowth, through which it is very difficult to force a way. A second expedition was undertaken towards the end of February of the same year, all three officers taking part. The first attempt was made from the west coast north of Macpherson's straits, but though an inhabited camp was discovered and surrounded, the attempt to capture the people asleep failed, two children only being secured. The party, therefore, proceeded to the big house near Port Anson, and after wandering through creeks, over precipitous hills and dense jungle for some time, succeeded in discovering the main track south and various Jarawa camps. One of these was found to be occupied, and another night attempt at the capture of its inhabitants made, which ended fatally for Mr. Vaux, who was transfixed by a Jarawa arrow and died within a few minutes. Two women and six children were secured, but, owing to the fatal mishap, no further attempt to capture the men was made. Drawings are given of several of the camps and of the big house near Port Anson.

The Minbu District, Upper Burma.—An examination of the vegetation of this district was made in 1903 by Captain A. T. Gage, I.M.S., curator of the Calcutta Herbarium, who reports on his observations in the *Records of the Botanical Survey of India* (vol. 3, No. 1). They are of interest as affording a good insight into the relations between physical conditions and vegetational features. The district lies roughly between 20° and 21° N., 94° and 95° E., *i.e.* between the Irawadi and the Arakan Yoma range. It consists of three meridional zones distinct both in their physical and vegetative characters. The first, in the west, comprises the eastern flanks of the Arakan Yomas and a very distinct narrow range of hills, to which, though not named on the map, Captain Gage applies the name "Nwamadaung hills." On the east there is an alluvial belt fringing the Irawadi, while the intermediate zone, occupying the greater part of the area, is named by the writer, for want of a more precise descriptive term, the "desert zone." It is drained by the three rivers, Salin, Mon, and Man. The Nwamadaung range, where traversed, was covered with fairly open deciduous forest. It being the hot weather, all the trees were leafless, while the shrubby undergrowth was scanty, and herbaceous vegetation practically non-existent. Palms and orchids are absent. Up to between 2000 and 3000 feet the Arakan Yomas are covered with practically the same forest as clothes the Nwamadaung range, but above 3000 feet the deciduous forest gives place to an evergreen forest. The flat alluvial belt is either cultivated, covered with savannah grass or with a thin sprinkling of trees, the toddy palm (*Borassus flabellifer*) being very abundant near villages. The shrubby element is varied, climbing plants naturally few, but herbaceous plants abundant. The alluvial belt vegetation is prolonged up the banks of the rivers. The desert zone, which becomes more rugged and hilly as one travels westward, has a characteristic vegetation of mixed gregarious species forming a spiny or prickly scrub. The difference between the flora of the Arakan-Nwamadaung and desert zones is entirely natural and dependent on difference of altitude and climatic conditions. The difference between the desert-zone flora and

that of the alluvial belt is chiefly due to the influence of the Irawadi, whose waters permeate the latter and allow many species to flourish which could not otherwise do so. The discussion of the affinities of the flora leads to some interesting results. The mountain zone shows a considerable percentage of endemic (Assam-Arakan) species, most of them new to science, while of the remainder, Burmese species come first, those common to India and Malaya second, and those common to China, India, and Malaya third. The alluvial belt has many general Eastern tropical or cosmopolitan tropical species, with some Indo-African; while the desert zone, though with a fair number of endemic Upper Burma species, is characterized above all by the preponderance of Deccan and Indo-African species. It is possible that this element is but the remnant of a flora once common to the Malay peninsula, India, and Africa (when the distribution of land and water was other than the present), but driven northward by the breaking up of land surfaces in the eastern peninsula, with the change of climate thereby brought about.

Place-names in the Travels of Pedro Teixeira.—Colonel Gerini, whose long-continued study of the historical geography of the Far East entitles him to speak with authority, gives a note in the *Journal of the Royal Asiatic Society* for October, 1904, on the identification of some place-names mentioned in Teixeira's travels lately printed by the Hakluyt Society. The first of these is "Olanion," a kingdom producing benzoin, which he shows with great probability to be merely the transcript into Spanish of the Portuguese Lanjão with the article prefixed. The realm is thus the Lanjioni of the Italian missionaries, Lan John of early English travellers, properly Lan-cheng with its capital Wieng Chan on the middle Mekong. "Pole," again, is the Pulai river near the old Singapore strait, which Colonel Gerini had previously been led to connect with one or other of the states named Po-li in the Chinese records. "Pate," a seaport on the east coast of the Malay peninsula between Siam and Patani, with rich mines of tin near it, he takes to be the same as Tavernier's *Bata*, which is mentioned in conjunction with *Delegore* (Ligor), *Sangore* (Senggora), and *Bordelon* (Phattalung), and which would seem to be either Patanor, Bordia, or Pateo, most probably the first named, near which tin was certainly worked in Tavernier's time. The state of Po-ta, referred to in the annals of the first Sung dynasty in China, may be this same *Bata* or *Pate*. Lastly, "Sabam strait" (Sabão of the Portuguese) is that between the Karimun-Kundur group of islands and those bordering the east coast of Sumatra. It takes its name from Sabong, formerly applied to the islands south of the Great Karimun.

AFRICA.

The Tanganyika Problem.—The present position of the problem connected with the origin of Lake Tanganyika and its fauna of apparently marine affinities has been ably summed up by Mr. W. H. Hudleston in a paper read before the Victoria Institute in May, 1904, and printed in vol. 36 of the *Journal of Transactions* of that body. In the first section Mr. Hudleston discusses the views of Mr. J. E. S. Moore from the point of view of general zoological and palæontological considerations, passing in the next to an examination of our existing knowledge of the geology of equatorial Africa, of which he supplies a useful summary. In dividing the whole of Africa into three great divisions, viz. the Northern, the Region of Great Deserts, and Peninsula Africa, he points out the marked difference which exists between the two last, in that, while in the second division fossiliferous marine beds of Mesozoic and Tertiary age penetrate into the heart of the continent, in the third such beds occupy but a narrow fringe between the sea and the peninsular massif. In considering the geological aspects of the Tanganyika problem,

it is necessary to have some idea of the geology both of the East African system of ranges and of the Congo basin, since the lake lies in the border zone between the two. In the former the primitive crystalline system has been invaded by an enormous extent of volcanic extravasations, the date of which may be safely said to be post-Jurassic, probably considerably later, the first series of rift-valley faults dating likewise, in all probability, from so late a period as the Upper Eocene. The Congo basin, as is well known, is marked by two great series of sandstone formations probably covering more ground than any other sedimentary beds throughout Africa, which are probably contemporaneous with the Karroo of South Africa, and give no sign of marine origin. They seem to be mechanical sediments, which accumulated at a time when the basin had no drainage outlet. The basin, as a whole, is outside the influence of the East African disturbances, but the Red Felspathic grits, the lower of the two series, are occasionally tilted in the Tanganyika region, into which they extend. The lake has therefore come within the influence of those disturbances. In the third section the writer sums up the conclusions to be drawn both from the zoological and palæontological evidence and from the geological facts. He points out that the undoubted peculiarities of the Tanganyika fauna have so far failed to establish any connection with the inferior Oolite of the Anglo-Norman basin, while the character of the Jurassic fauna of intermediate areas likewise does nothing to bridge over the divergence. Nor, again, does the fauna of known Jurassic deposits within the African tropics show any analogy with the gasteropod fauna of Tanganyika. The geological argument tends in the same direction. The origin of Tanganyika as a rift-valley lake cannot be older than Middle Tertiary, while, although large lacustrine sheets of a different character no doubt existed earlier, the geological history of the Congo basin gives no indication of the presence of a Jurassic or even a Cretaceous sea. The problem in its main features must thus be regarded as still unsolved.

Prof. C. Uhlig's Scientific Researches in East Africa.—A letter from Prof. Uhlig, who early in 1904 went out to East Africa at the expense of the Otto Winter Fund for the purpose of scientific research, appeared in *Petermanns Mitteilungen*, No. 9, 1904. From this it appears that the professor's work is likely to be fruitful in additions to our knowledge of the physical geography of that region. He had made a careful examination of the shores of the Victoria Nyanza, and had brought to light the existence of recent volcanic formations on the east coast near the southern boundary of British territory. Inasmuch as the deepest sounding hitherto obtained by Commander Whitehouse (269 feet) was in this neighbourhood, Prof. Uhlig is inclined to think that a recent subsidence has taken place here. On the south-west coast he also saw indications of recent tectonic disturbances, and thinks that the line of islands off the coast is of the nature of a much-broken "Horst." (In this he is in agreement with Captain Herrmann's views, cf. *Journal*, vol. 15, p. 179.) The traveller had subsequently proceeded to Mount Kilimanjaro, where he had noted the surprising fact that, in spite of an unusually heavy rainy season, the ice on the Kibo crater showed marked signs of retreat as compared with former observations.

The Uganda Protectorate in 1903-1904.—The general report of Colonel Hayes-Sadler, commissioner for the Uganda protectorate, which was presented to Parliament in November last, is one of the most encouraging documents that have come from the British African possessions for some years. In the words of the commissioner himself, "The general results of the year may be summed up in increased efficiency of administration, and the maintenance of undisturbed peace and order; in a satisfactory increase of revenue and decrease of expenditure; in a large expansion in trade, particularly in imports; and in a general advance in

material and social well-being, despite the fact that progress was hampered by the continuance of the sleeping-sickness epidemic." It is naturally in the headquarters of the protectorate, or Uganda proper, which possesses the advantages of direct steam communication with the coast, and the resulting closer touch with the outside world, that most signs of progress are observable. Especially good results have been obtained from the system which has been introduced of collecting the hut tax, when possible, in salable produce, which is immediately handed over to the merchants, and thus gives an important stimulus to trade and agriculture. An increase of prosperity and well-being is said to be apparent on all sides in Entebbe and Kampala, where new shops have been opened, and new industries started, all shops and dwelling-houses of the traders being now built of brick and iron. The number of rupees in the country has been largely increased, and the introduction of a very small copper coin to take the place of the cowrie is under consideration. The Lukiko, a native council, has done good work, and its measures and decisions appear to give general satisfaction. In the central province (Busoga, etc.) a good start has been made towards acquiring a firmer grasp in matters of administration, steps having been taken to train up the younger men for their future duties as chiefs. In Ankole, the healthiest part of the protectorate, a distinct change for the better has made itself felt, and the people are content and satisfied with their present state. The Nile province suffers from its remote situation and difficulties of communication, which makes it impossible to exercise control over the inland tribes. The telegraph has, however, been carried to Wadelai, and will soon be extended to Nimule. Considerable progress has been made with the work of the survey department of the protectorate, the staff of which has been much increased. Plane-tabling was carried out over an area of 5200 square miles, making a total of 7000 since the beginning of the work. Observations with the 10-inch theodolite were taken over 2465 square miles, and 116 miles of secondary triangulation completed, 450 miles being mapped in detail on the 1-inch scale. The admirably appointed steamers of the Uganda railway are doing good service. They call weekly at Entebbe, Munyongo (the port for Kampala), and Jinja, while one steamer makes the tour of the lake once a month. The scientific and forestry department is doing good work, especially in the study of products likely to have an economic value. The Botanical Gardens have been considerably enlarged, and experimental plantations established in Buddu and the Sesse islands. Lastly, the system of meteorological observations established in 1901 is being constantly extended. The year 1903 was a record one for rainfall, which reached a total of 62·88 inches.

Dr. David's Journeys around Ruwenzori.—A further note on Dr. David's journeys (*Journal*, vol. **24**, p. 348) has appeared in *Globus* for October 13, 1904. Writing to Dr. Schweinfurth on August 22, from the shores of Lake Albert Edward, Dr. David reported that he had proceeded from Toro to the Semliki valley in a single day by a mountain pass 6230 feet high, reaching in this way the damp mountain forest which extends between the Semliki and the range. In about 40′ N. he had discovered a series of boiling-hot sulphur and brine springs, over twenty in number. The trip had been an unfortunate one, as he had fallen into the hands of marauding Banyoro, who had led him astray for eight days through the forest, with the result that he had lost all his *impedimenta*.

Hydrographical Survey of the Senegal and Niger.—An important undertaking, having in view the thorough examination of the channels of the Senegal and upper Niger and their improvement for purposes of navigation, was set on foot a couple of years ago by the governor-general of French West Africa, and has already led to valuable results (*La Géogr.*, vol. **10**, 1904, p. 187). The head of the mission is Lieut. Mazeran, previously known for his excellent work

on the Mekong, who is supported by Lieut. Dyé—a member of the Marchand expedition, and known to geographers for his excellent surveys in that capacity—and a number of other assistants. The work in West Africa has been done in the most complete and careful manner. The first task was to execute a large-scale survey of the river-channels and banks; the position of every rock, sandbank, and other danger to navigation being marked, the depths accurately determined by soundings, and the contour of the banks mapped in detail. This has been carried out for the Senegal alone over a distance of more than 550 miles. Another important piece of work was the beaconing of the course of the Senegal, which has long been urgently needed in the interest of safe navigation, many disasters having occurred through the want of such precaution. It has already been carried out over more than half the course of the Senegal, the beacons including some twenty masonry towers of 40 feet high, in addition to over a thousand iron posts. As an outcome of the work of the mission, it is proposed to set on foot works for the improvement of the river-channel in the form of weirs, embankments, dredging, and the like.

New Reorganization of French West Africa.—The administrative system introduced into French West Africa by the decree of October 1, 1902 (cf. *Journal*, vol. 21, p. 188), has now been modified by a decree signed by the President of the French Republic on October 18, 1904. The new organization involves not so much a change in principle, as has been the case with many of the previous changes introduced into the administration of these territories, as an extension in greater detail of the principle already adopted. Thus the independence of the governor-general of local considerations, and the general supervision exercised by him over the whole territory, is further promoted by the erection of the wide territories of the interior into a regular "colony," under civil administration, to be known as the "Colony of the Upper Senegal and the Niger." This will begin (from the west) at Kayes, the former "pays de protectorat" on the left bank of the Senegal being now added once more to the Senegal colony. The chief centre of the new colony will be at Bammako, which is bound to take an important place in the development of these interior territories as the terminus of the Senegal-Niger railway, now completed. The civil portion of the colony will include *inter alia* the area formerly known as the second military territory, while a military territory will also be attached to it, formed by the existing first and third military territories, to be placed under a single "commandant," responsible to the lieut.-governor of the colony. The colonies of French Guinea, the Ivory Coast, and Dahomey suffer no change of limits. A further modification introduced by the new decree is, however, the formation of a new civil territory embracing the Moorish districts to the north of the Senegal, lately brought under French influence, but not yet fitted for an administration such as is in force in the more settled districts in Senegal proper. This will be known as the "Civil territory of Mauritania."

AMERICA.

Northern Alaska.—The account of a reconnaissance, carried out under the U.S. Geol. Survey Department by Mr. W. C. Mendenhall, adds considerably to our knowledge of the geography and geology of Northern Alaska (U.S. Geol. Survey, Professional Paper No. 10, Washington, 1902). Leaving Fort Hamlin June 18, 1901, the party ascended the Dall river, arriving on the 27th at "Dall City." The lower 50 to 60 miles of the Dall—half its length—lie within the Yukon flats, a region of sloughs and ponds. For 25 miles below the "City," the Dall runs through a broad valley bounded some distance on either side by hills approaching the river and rising in height towards its source. The divide between the Dall and Koyukuk is 3000 to

3500 feet above the sea, the gap at head of the Dall being a cut 1500 feet below this level. From Dall City the survey made a portage of 18 miles to the Kanuti river, involving a climb of 2500 feet. Two hundred miles long, the Kanuti, a few miles from its source, enters a flat basin 9 to 10 miles long by 5 broad. At its lower end it runs for 30 miles—a stretch scarcely navigable—through a canyon reaching 2000 feet in depth. Twenty-five miles above its mouth it plunges into a second canyon 10 miles long by 500 feet deep, and 10 miles above its mouth it receives the Mentanontli, descended by Allen in 1885. The hills bordering this lower section, 1500 feet high, are well timbered. Ducks and geese abound on the Kanuti. Descending to Koyukuk, the party ascended the Allen, which is free from serious rapids. Its lower valley, above the flats adjacent to its mouth, is 5 to 10 miles wide, and bordered by rounded hills reaching to a height of 2000 to 2500 feet. Helpmejack creek, 90 miles from mouth of Kanuti, is the first important affluent of the Allen encountered in the ascent, and enters the main stream through a canyon-like north-to-south valley. The survey reached the Allen on July 24. Between Allen and Kowak there was a portage of 5½ miles, with a climb of only 300 feet. The Kowak, reached August 10, rises north of 67° N. and west of 154° W. At the mouth of the Kichaia Kaka affluent the Kowak is a beautifully clear mountain stream, 125 feet wide and 6 to 8 feet deep. Near the head of the river the valley is fully 3 miles wide and broadens below Walker lake, which is drained by its upper waters. This, the most important of the Kowak's upper lakes, is 14 miles long, 2 miles broad at its southern, and 1 mile at its northern end. It is bordered on both sides by precipitous mountains rising 3000 to 4000 feet. Nutavukli lake, half the size of Walker, was reached August 13, and next day the lower gorge of the Kowak. West of this, the valley, broadening at 154½° W. to 10–20 miles, maintains this width to 160° W., where it suddenly contracts till only 2 miles wide. Thence it again broadens to the head of the delta, where it enters a great flat. Among its numerous tributaries the most important is the Ambler from the north, joining the Kowak at 158° W. Below Squirrel affluent the Kowak breaks into a number of channels expanding into the maze of intricate sloughs which make up its delta. The complex of more or less schistose sediments near the base of the geologic scale of Alaska, described by previous geologists, is discussed in detail.

Exploration in Western Mexico.—Dr. O. C. Farrington, of the Field Columbian Museum, Chicago, describes a journey made in 1896 in the Sierra Madre of Mexico, west of Durango, in publication No. 89 of the Museum (Geological Series, vol. 2, No. 5). The physical geography of this part of Mexico is still little known, none of the few writers who have touched upon it (including Dr. Schiess, of whose journey* Dr. Farrington does not seem to be aware) having possessed special competence in this respect. The present *brochure* is therefore of considerable interest, especially as it contains some excellent photographs of the characteristic scenery of the country. An important point discussed by the writer is that of the history of the drainage system of the region about Durango. While the suburbs of this town are drained by the Rio Tunal, which flows through the Mezquital into the Pacific, the longitudinal valley to the north is drained by streams which unite from north and south courses to flow eastward as the Nazas, terminating at the present day in the Laguna de Mayran, which has no outlet. The existence in the Nazas of species of fish which also occur in the Rio Grande points to the former existence of a connection, now interrupted. While this may

* *Journal*, vol. **21**, p. 543. See also a note on a geological examination, by Mr. W. H. Weed, of a more northern section of the range in *Journal*, vol. **22**, p. 462.

have been in part due to a warping of the valley or to increasing aridity of climate. Dr. Farrington is inclined to attribute the diminution of the eastern waters to abstraction by westward-flowing streams, pointing to the fact that the Tunal likewise contains Rio Grande species, as an indication that this river has probably cut back into streams that once flowed eastward. West of Durango the country continues arid for some distance, but extensive forests of pines, interspersed with oaks, soon make their appearance. Apart from a few unimportant ranches, the region is uninhabited, though pack-trains were met at least as often as once a day. The plateau rises steadily towards the west, and at the higher levels the temperature is too cold for wheat, though grass grows in abundance, and mountain streams with clear waters were crossed at intervals. Dr. Farrington left the trail to inspect the strange natural phenomenon known as the "city of rocks," of which he gives some striking views. These rocks are marked by the rounded outlines characteristic of weathered surfaces, but a remarkable feature is the complete removal of the products of decay, probably due to the texture and composition of the rock (a rhyolite) and to the scarcity of joints. A few hours west of the "city" the western edge of the plateau is reached, a maze of peaks and valleys—due evidently to a profound dissection of the edge of the plateau by short swift rivers—comes into view, the valleys nearest the plateau often having the form of an amphitheatre. The structure outlines of many of the peaks suggest sedimentary rocks, though eruptive rocks probably prevail. In descending westward all gradations of temperature are experienced, while the abundant vegetation of the upper and middle slopes gives place lower down to semi-arid conditions, caused probably by the warmth of the land, which prevents sufficient cooling of the winds to produce precipitation until the summit is reached. The uninhabited character of the region traversed is due, however, not to climatic conditions, but to the tremendous barriers to traffic presented by the topographical features. The paper concludes with a description of the Cerro Mercado, a hill largely made up of solid iron ore, which lies a little to the north-east of Durango.

The Falkland Islands and their Stone-rivers.—In a recent number of the *Memoirs of the Manchester Literary and Philosophical Society* (vol. 48, part 3), Mr. Rupert Vallentin gives some notes on a visit to the Falkland islands in 1900, chiefly for zoological research, with the results of which the greater part of the paper is taken up. There are, however, some observations of geographical interest, in particular on the mode of formation of the stone-rivers which have engaged the attention of most visitors to the group. Mr. Vallentin would regard these not as streams of *débris* brought down from the hillsides, but as portions of the general substructure of the islands laid bare by the removal of the peaty soil with which it is elsewhere covered. The stones, in his opinion, have existed for ages in their present positions, vegetation having subsequently spread over the land owing to changes of climate. He says that on digging into the peaty soil at the foot of every stone-run, rocks identical both in form and structure to those already exposed can be uncovered, while a stream of underground water can be detected, which is constantly carrying away the soil. The amount of soil carried down by the torrents from the hillsides after a heavy rainfall is shown by the depth of mud in the various creeks and harbours. The islets of vegetation to be found in all stages of formation in every stone-run, of which excellent photographic illustrations are given, are regarded as remnants of the former coating of vegetation. Among other localities, Mr. Vallentin visited Roy cove in the West Falklands, where he found the scenery and vegetation far more attractive than in the neighbourhood of Port Stanley, the high grass and higher Fachina bushes (*Chilabothrium*) giving an agreeable finish to the landscape. On some small islands the tussac

grass formed a high and dense growth. The sides of all the estuaries and coves in this part of the group are almost fringed with the beautiful and fragrant Falkland box (*Veronica decussata*), which is used as a sheltering hedge in many of the gardens. Ferns, including a pretty tree-fern (*Gleichenia*), were also seen. The bog-balsam (*Bolar glebaria*), though still very common, does not attain the size it formerly did, owing to the trampling of sheep, which bruises the hard exterior and causes rapid decay. Mr. Vallentin gives an interesting account of the penguin rookeries, and adds a list of the fauna, mainly consisting of birds. His inquiries as to the now extinct Falkland island wolf led him to believe that this animal possessed a social habit.

AUSTRALASIA.

Queensland Farming Industries.—The Government statistician's report on the agriculture of Queensland shows that on December 31, 1903, there were depastured in the state 401,984 horses, an increase on 1902 of 2862; 2,481,717 cattle, a decrease on 1902 of 61,754; 8,392,044 sheep, an increase on 1902 of 1,178,059; 117,553 pigs, an increase on 1902 of 40,351. Within the last decade there is a remarkable decrease in the number of cattle and sheep. Whereas in 1894 there were 7,012,997 cattle, in 1903 there were only 2,481,717, a decrease of 65 per cent. Sheep, too, have decreased from 19,587,691 in 1894 to 8,392,044 in 1903, or 57 per cent. Though its climate and pastures are admirably fitted for horse-breeding, Queensland has as yet little profited by this fact. During the Boer war in 1901 and 1902, 20,000 horses were with difficulty supplied to Africa, and these mostly not of a creditable type. Upwards of three-fourths of the cattle are held, in herds of not less than 300 in number, by 4 per cent. of the total number of owners, which reaches 23,610. The 8,392,044 sheep returned for 1903 were, on the other hand, owned by only 1914 persons. Of these 5,097,247 were owned by 115 persons, giving to each 44,324 sheep, but for a number of years sheep-farming has been tending in the direction of smaller flocks and holdings. In 1894 the average number of sheep to each owner was 12,366, and in eight to nine years this figure dwindled to one-third. Taking ten head of sheep as equivalent to one horse or head of cattle, the total number of horses, cattle, and sheep in Queensland in 1903 gave 56 sheep or their equivalent to each square mile, and 72 to each inhabitant. The total export of wool, scoured and greasy, in 1903 amounted to 34,979,076 lbs., of the value of £1,883,752, an increase on 1902 by 5,124,496 lbs., valued at £572,326. Of the exported products of the state, totalling £9,087,874, the pastoral products were valued at £4,221,780, or 46 per cent. of the whole. In 1903 there were 18,750,604 gallons of milk dealt with for conversion into butter, against 13,787,175 gallons so used in 1902. In 1903 the land under cultivation comprised 621,693 acres, of which 566,589 were under crop. Passing by 1902 as a year of drought, the figures in 1901 were 507,317 acres under cultivation, and 483,460 acres under crop. The quantity of cultivated land to which water was artificially applied was, in 1903, 14,786 acres against 14,344 in 1902. The report gives satisfactory returns of the corn crops, and those of sugar, coffee, pumpkins, fruit, vines, etc.

The Dutch Expedition to New Guinea.—An important expedition for the purpose of exploring the interior of Dutch New Guinea, organized under the auspices of the Netherlands Geographical Society, started early in 1904 for the scene of its labours, and some account of its proceedings down to June 18 last has been given by Mr. J. W. Ijzerman in the *Tijdschrift* of the Society above mentioned (1904, No. 5). The leader is Mr. R. Posthumus Meyjes, who has with him various assistants, including Dr. Koch as natural history collector. On the

way out to the East, Mr. Meyjes stopped at Florence, where he met and consulted with Sir W. MacGregor, the naturalist travellers Beccari and Loria, and Prof. Giglioli. After the arrival at Batavia, some time was taken up in preparations, including arrangements for coolies, military escort, and so forth. Arriving at Merauke (New Guinea) on April 5, Mr. Meyjes did some preliminary work in the way of surveys and observations on the south coast of New Guinea, making a trip also to Thursday island in order to connect his surveys with previously fixed positions. During the voyage along the coast he was gratified with an unusually clear view of the mountain range, the exploration of which is one of the objects of his expedition. It seems to have left no room for doubt that a part, at least, of the range—that north of Pisang bay—is snow-clad. One peak appeared to be entirely white, with streaks of snow as if surrounded by glaciers. During an investigation of the coast east of Puriri a river was discovered—the Tania or Utakwa (possibly that marked on the map as the false Utanata), the entrance to which seemed to be more practicable than of most, probably allowing the passage of a vessel drawing 11 or 12 feet at high water and in calm weather. It was hoped that this river might afford a means of penetrating inland. Further east there were many river mouths, broad but shallow, forming apparently a great delta. At the date of his last letter, Mr. Meyjes had returned to Surabaya and Batavia to make the final arrangements for the main expedition.

POLAR REGIONS.

Proposed Scientific Station in West Greenland.—Mr. Morten P. Porsild, assistant in the Botanical Garden at Copenhagen, has proposed that a permanent scientific station should be established in West Greenland, preferably on the south coast of Disco. Mr. Porsild took part in the Steenstrup expedition to West Greenland in 1898 as botanist. He published the botanical results (*Meddelelser om Greenland*, part 25), and again visited Greenland in 1902. His view that a fixed biological observatory is necessary to secure completely satisfactory results may be accepted. For one thing, remains of plant life might be discovered which would throw light on the history of the Greenland flora from remote times. Many other questions bearing on Arctic geography and geographical distribution might be solved by patient research from a fixed station in Greenland properly equipped. It is to be hoped that Mr. Porsild may be successful in obtaining the necessary funds for such a laudable undertaking.

Antarctic Medallists of the R.G.S.—A list has been compiled by the President of all the recipients of medals and other awards given by the Society for Antarctic exploration. It has been bound and placed in the library, where it will be available for reference. Naturally the bulk of the compilation has to do with the recent Antarctic expedition, the names of all the officers, members of the scientific staff, and men being chronicled, with a statement of the total amount of sledge-travelling accomplished by each, as well as of the longest continuous sledge journey. The earlier awards are eight in number, the recipients being Captain John Biscoe, Sir James Ross, Sir Joseph Hooker, Captain Charles Wilkes, Captain C. A. Larsen, M. H. Arctowski, Captain W. Colbeck, and Mr. L. C. Bernacchi, the last two having received grants in 1901 for their work with the Newnes Expedition.

GENERAL.

The Wak-wak Islands of the Arab Geographers.—M. Gabriel Ferrand discusses the identification of the Wak-wak islands of Al Hamdani, Ibn Khordadbeh, Masudi, and other Arab geographers, in a recent number of the *Journal Asiatique* (vol. 3, No. 3, 1904). The first-named distinguishes the Wak-wak

islands of China from those of the south, and the former have been shown with reason by Mr. J. de Goeje, in an appendix to the 'Book of the Marvels of India (Leyden, 1883–86), to represent Japan. Definite statements as to the position of the Wak-wak islands of the south are made only by Masudi and his copyists, who associate them with Sofala and Zanguebar, and say that as the country of Sila (Japan) forms the limit of the Chinese sea, so the Wak-wak country is the furthest bound of the Sea of Zenj. Vague attempts have been made to identify this country either with the Seychelles or some other islands off the east coast of Africa, or even with the district of Ugogo inland from Zanzibar. M. Ferrand holds that it can only represent Madagascar, and gives two possible explanations of the name consistent with this identification. The first is from the Malagasy word *vahuaka*, in constant use in the senses of "kingdom," "subjects," "people," etc.; the second from the Malagasy name of the *Pandanus utilis* (*Vakua*). He inclines to the latter, as supplying some clue to the story of the marvellous tree of the Wak-wak country related in the 'Marvels of India,' the fruit of which resembled the head of a woman suspended by the hair, and when ripe emitted the sound of "wak-wak." The supposed existence of two distinct groups of islands bearing the same name, in such widely separated quarters as Japan and Madagascar, he attributes to the influence of the Ptolemaic idea of a closed Indian ocean, also suggesting that the similarity between the Malagasy word *Vakua* and the ancient Chinese name for Japan, Wo-kwok, may have led to the transference of the Malagasy legend to Japan. Attention is also called to the Swahili name for Madagascar, Buki, which cannot be derived from any Bantu root. M. Ferrand says that if his theory is accepted, it will be necessary to revise the currently accepted Arab geography in other points also.

The Explorers' Club.—The first general meeting of "The Explorers' Club," a recent organization to further general exploration, was held in New York City on November 12. The club was organized last spring by about fifty persons, and at the meeting on November 12, General A. W. Greely was elected the club's President for the ensuing year. The club has for one of its objects to bring the achievements of explorers to the attention of the public, and to secure public interest and co-operation therein. It will maintain headquarters in New York City, where the members can meet for social purposes, and where receptions can be tendered to explorers on their return from notable expeditions, and to foreign explorers of distinction visiting the United States. An exploration fund will be inaugurated, while illustrated lectures will be given from time to time at the club's headquarters. Following the business meeting, a banquet was served to sixty members and guests, among whom were, besides General Greely, who presided; Dr. A. F. Bandelier; Commander Robert E. Peary, U.S.N.; General Henry T. Allen, U.S.A.; Dr. Carl Lumholtz; Count Joachim von Pfeil; Dr. F. A. Cook; Colonel David L. Brainard, U.S.A.; Mr. Caspar Whitney; Mr. Frederic Palmer; Mr. Richard Harding Davis; Dr. Nathaniel L. Britton; Mr. Henry Collins Walsh; Dr. Donaldson Smith; Mr. Henry Biederbick; Major W. R. Abercrombie; General Frederick Funston, U.S.A.; George Bird Grinnell; Mr. F. S. Dellenbaugh; Mr. Henry G. Bryant; Mr. Oscar F. Crosby; Dr. William H. Furness; Mr. Alfred C. Harrison, jun.; Dr. H. M. Hiller; Mr. Henry C. Mercer. Interesting remarks were made by Dr. Bandelier on his recent travels in Bolivia and the Andes; by Count von Pfeil on his recent visit to the interior of Morocco; by Dr. Cook on Antarctica; by Mr. Frederic Palmer, war correspondent, on the operations of the contending armies in Manchuria, which he witnessed until October 1; and by Mr. Henry Collins Walsh, secretary of the club.

OBITUARY.

Lord Northbrook.

ALTHOUGH rather a statesman than a geographer, the late Earl of Northbrook, whose death occurred on November 15, 1904, was intimately connected with our Society, not only by membership lasting a quarter of a century, but by his tenure of the office of President at the very beginning of that period. This was in 1879-80, the year previous to his joining Mr. Gladstone's second administration as First Lord of the Admiralty, to which circumstance, and to the calls thus made upon him by the public service, was alone due the comparatively short period during which he retained the office. Short though it was, it was sufficient to prove his eminent qualifications for the task of presiding over the Society's meetings, at a time when the geography of the Indian frontiers was a subject of frequent discussion, and when his wide experience of Eastern affairs, gained as Viceroy of India, thus proved of especial value. In the social side of its activity, the Society likewise found in Lord Northbrook an excellent head, and to his urbanity and open-hearted hospitality a considerable portion of the success attending his year of office was no doubt due.

This is not the place to enter into a minute account of Lord Northbrook's public services, which have been adequately dealt with by the public press. The family of Baring, of which Thomas George, second Baron and first Earl of Northbrook, was the distinguished head, migrated to this country from Bremen early in the eighteenth century, and soon made its mark for the business capacity which has characterized so many of its members, and which during two generations was placed at the disposal of the East India Company. The father of the late earl was Sir Francis Baring, who, after a long period of public service, became first Baron Northbrook in 1866. Born in 1826, the earl, after graduating with classical honours at Oxford, served his apprenticeship in public affairs as private secretary to various heads of Government Departments, and entering Parliament in 1857, took office himself, first as a Lord of the Admiralty, next as Under-Secretary of State for India, and soon afterwards as Under-Secretary for War. In 1872 he succeeded the murdered Lord Mayo as Viceroy of India, his four years' tenure of which office was marked by a cordial sympathy with the feelings and aspirations of the Indian people, by useful reforms in the region of finance, and by the successful fight which he maintained against the horrors of famine in Bengal. The period was on the whole one of quiet and unsensational progress, and the chief public event was the successful visit of the Prince of Wales to India in 1876. Lord Northbrook left behind him in India many kindly memories, and his administration was certainly a beneficial one to the people at large, and tended to draw rulers and ruled into closer and more harmonious relations.

After his return to this country, Lord Northbrook remained out of office until the return of his party to power as the result of the general election of 1880, when, as already stated, he became First Lord of the Admiralty, under Mr. Gladstone. It was while holding this office that he was sent out, in 1884, as High Commissioner, to inquire into the financial position in Egypt, and that the advice which he gave in this capacity led to no practical result must be ascribed to the international fetters which hampered all true progress, and from which the country has only lately been freed as the result of the Anglo-French convention of 1904. Lord Northbrook's public career came virtually to an end with the political upheaval of 1886, in which he ranged himself on the side of the Unionists.

Lord Northbrook took to the end a lively interest in the affairs of Hampshire, in which his country seat was situated, being Lord-Lieutenant of the county, and chairman of the County Council as well as of its Education Committee.

Dr. Emil Schlagintweit.

The well-known writer on Eastern subjects, Dr. Emil Schlagintweit, died on October 29 last, at the age of 69 years. He was the youngest of four brothers, of whom the three elder, Herrmann, Adolf, and Robert Schlagintweit, are so well known to geographers for their important researches in the Himalayas and adjacent regions, carried out about the middle of the last century under the auspices of the Indian Government. The fourth brother, Emil, who, as we learnt from a short notice in *Globus* (vol. **86**, No. 20), was born in Munich in 1835, had his attention turned to things Eastern, and especially to the history and literature of Tibet, as a result of his brothers' researches, and his close study of these subjects had its outcome in several important works, which appeared between 1863 and 1896. Another and more popular, though a careful and accurate work, was his 'Indie in Wort und Bild,' which originally appeared in 1880–81, a second edition being called for in 1890. Dr. Schlagintweit several times took part in the controversy regarding the snow-peaks visible from Khatmandu, holding that the Gaurisankar of his brother Herrmann was identical with the Mount Everest of the Indian Survey Department.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1904-1905.

Second Meeting, November 21, 1904.—Sir CLEMENTS MARKHAM, K.C.B., in the Chair.

ELECTIONS.—*Robert à Ababrelton; George Frederick Andrews; Rear-Admiral Charles Arbuthnot; Oliver Bainbridge; Sir Alexander Baird, Bart.; J. Benson (5th Fusiliers); Arthur Boake; John Buchan; Charles Gerald Bush; Henry Adolph Bush; Rev. S. R. Cambie; Luigi Camera; John Campbell; Edmund Drinkwater Carver; Cyril Claridge Chambers; H P Charnley; Lieut. Sydney Herbert Charrington (The King's Hussars); Commander Louis Weatworth P. Chetwynd, R.N.; Charles A. Clark (late Lieut., U.S.A.); Captain Frederick Laurence Stanley Clarke (30th Punjabis); Frank Benedict Cleland; G. R. Clerk; Lieut. Edward Clive Coates (15th Hussars); Charles Curtis Craig, M.P.; Eliot Crawshay-Williams (late Royal Field Artillery); William Penn Cressen; Alfred Herbert Crook (Queen's College, Hong Kong); George Crowther; Major-General James Turner Cummins, C.B.; Thomas Kirkman Dealy; Robert Paget Dewhurst; Edwin S. G. Dottridge; John Edwards (South African College School); Captain England, R.N.; Rupert G. England; C. Reginald Enock; Patrick Gibson; John A. Ley Greaves; Herbert Guernsey; Captain Clarence Preston Gunter, R.E.; J. G. Hamilton, M.V.O.; Frank E. Harvey; George Leonard Harvey, C.E.; Captain G. J. Henderson, R.F.A.; James Clement Holden; Herbert C. Hoover, M.E.; Hon. Oliver Howard; Edward Hutchinson; Charles Inglis Hutton; James Thorburn Irvine; Captain Lionel James (4th Co., London I.Y.); Lieut. George William Jenkins, R.N.R.; B. H. Jessen; Joseph Kennedy, I.C.S. (retired); Arthur Laughton; Alfred Perkins Merrill; John Francis Molyneux, M.R.C.S.; R. Hervey de Montmorency; Benjamin Henry Hutton Mundy; Leonard John Newmarch; Captain Francis Charles Methuen Noel, R.N.; John Switzer Owens;*

Lieut.-Colonel Malcolm Peake, R.A.; Prof. Raphael Weller Pumpelly; John William Ramshaw, A.C.P.; Captain Frederick St. George Rich, R.N.; Frank Sherwin Richardson; Reginald A. Roberts; Rev. Leonard Robin; George H. Robinson; Charles Russell; Wm. Morris Schlesinger Selwyn; Captain G. C. Shakeley (King's R.R. Corps); Lieut.-Colonel Robert John Simpson (R.A.M.C., C.M.G.); Sydney Frank Smith; Frank Spenlove-Spenlove; Dr. J. F. Stewart; P. C. Anstruther Stewart; David Croal Thomson; John T. Thomson; Lieut. Frederick Edward Thornton (Royal Scots Fusiliers); George Threlfall; Ivon Tuxford; Major John Vans Agnew (Indian Army); Alban Voigt; Captain Thomas Philip Walker, R.N.; Ralph Walter; Francis William John Webb; Lieut. C. D. Webster (Indian Army); Leo Weinthal; Fleetwood H. Williams; Richard Warner Williams; George Benton Wilson; Sidney James Woodhouse; Colonel William Arthur Young (Commanding 2nd Battalion Royal Scots Fusiliers).

HONORARY CORRESPONDING MEMBER.

General Manuel Reyes (President of Colombia).

The Paper read was:—

"Explorations in the Western Himalayas." By Dr. Hunter Workman.

Third Meeting, December 12, 1904.—COLONEL G. E. CHURCH, Vice-President, in the Chair.

ELECTIONS.—*Captain W. J. B. Allen, R.F.A.; Alexander Begg; Captain L. E. Anstey Bennett (Paget's Horse); Frank P. Clark; Rev. W. H. Wurdle Cooper, M.A.; Alexander Frederick Fellowes; Henry Aylmer Humphreys; General Sir Archibald Hunter, K.C.B.; Jules Joseph Georges Lionnet; Edward Lunn; Bertie Pardoe Thomas; David William Middleton Thompson; Maximilian John Ludwick Weston; Charles Wibberley.*

The paper read was:—

"Explorations in Bolivia." By Dr. H. Hoek.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C. R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. (mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological, etc.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps—Plant-life. **Schroeter.**

Das Pflanzenleben der Alpen. Eine Schilderung der Hochgebirgsflora. Von Dr. C. Schroeter. Erste Lieferung. Zürich: A. Ranstein, 1904. Size 9½ × 6½, pp. 124. *Maps and Illustrations. Price* 3*s.*

To be completed in four parts. The work will have a distinct bearing on geography, as it discusses the relation of the plant-life to external factors.

Austria—Climatography. **Hann.**

Klimatographie von Österreich. Herausgegeben von der Direktion der K.K. Zentralanstalt für Meteorologie und Geodynamik. I. Klimatographie von Niederösterreich. Von J. Hann. Wien: W. Braumüller, 1904. Size 11½ × 7½, pp. 104. *Map. Presented by the K.K. Zentralanstalt für Meteorologie.*

This will be noticed elsewhere.

Austria—Herzegovina. *La G., B.S.G. Paris* **10** (1904): 109–114. **Laloy.**

Anthropogéographie de l'Herzégovine. Par Dr. L. Laloy.

Balkan Peninsula. *Mém. S.G. Genève* **43** (1904): 1–93. **Pittard.**

Ethnologie de la Péninsule des Balkans. Par Dr. E. Pittard. *With Plates.*

France—Gascony. *B.G. Hist. et Descriptive* (1904): 96–105. **Saint-Jours.**

Il n'existait pas de baies ouvertes en Gascogne. Les dunes n'empiétaient pas. Par M. Saint-Jours.

France—Landes. *B.S.G. Com. Bordeaux* **30** (1904): 306–312. **Buffault.**

A propos des origines celtiques et phocéennes de la toponymie landaise. Par P. Buffault.

Germany. *J. Manchester G.S.* **19** (1903): 125–150. **Mellor.**

The Wendish Baltic Ports of the Hanseatic League. By E. W. Mellor, J.P. *With Map and Illustrations.*

Germany.

Handbuch der Wirtschaftskunde Deutschlands. Herausgegeben im Auftrage des deutschen Verbandes für das Kaufmännische Unterrichtswesen. Vierter Band. Leipzig: B. G. Teubner, 1904. Size 10½ × 7½, pp. vi. and 748. *Map. Price* 18*m. Presented by the Publisher.*

The first three volumes were noticed in the *Journal* for August, 1904, p. 210.

Hungary—Magyars. *Deutsch. Rundschau G.* **26** (1904): 490–494. **Francé.**

Der echte Typus der Magyaren. Von R. H. Francé. *With Illustrations.*

Italy—Bibliography. **Magistris.**

V. Congresso Geografico Italiano. Della necessità di redigere la "Bibliografia Geografica della Regione Italiana" per il Secolo XIX. Relazione di L. F. de Magistris. Size 9½ × 6½, pp. 6. *Presented by Prof. G. Cora.*

Italy—Bolsena. *B.S.G. Italiana* **5** (1904): 407–423. **Palazzo.**

La Stazione Limnologica di Bolsena. Comunicazione del Prof. L. Palazzo. *With Illustrations.*

See note in the October number (p. 476).

Italy—Campania. **Porena.**

Filippo Porena. Campania Felix! Dono del V. Congresso Geografico Italiano. Napoli, 1904. Size 10 × 7, pp. 24. *Map. Presented by Prof. G. Cora.*

Italy—Geographical Manuscripts, etc. **Bertacchi.**

V. Congresso Geografico Italiano. Della Necessità di riprendere e integrare l'elenco iniziale del Narducci sulle opere geografiche manoscritte e sulle più rare a stampa esistenti nelle Biblioteche del Regno. Relazione del Prof. C. Bertacchi. Size 9½ × 6, pp. 6. *Presented by Prof. G. Cora.*

Italy—Sicily—Etna. *Popular Sci. Monthly* **65** (1904): 452-456. **Eastman.**

A Second Century Criticism of Virgil's Etna. By Dr. C. R. Eastman.

Reproduces the passages in which Aulus Gellius records the criticism of Virgil's verses on Etna by the philosopher Favorinus.

Italy—Sicily—Etna. **Platania.**

Su un moto differenziale della spiaggia orientale dell' Etna. Prof. G. Platania. Size 9½ × 6½, pp. 4. *Presented by Prof. G. Cora.*

Italy—Sicily—Rain. **Eredia.**

Sulla distribuzione della pioggia in Sicilia. Nota del Dottor F. Eredia. Size 9½ × 6½, pp. 8. *Presented by Prof. G. Cora.*

Italy—Solfatara. *G. Anzeiger* **5** (1904): 145-150. **Filek.**

Die Solfatara. Eine geographische Studie. Von Dr. E. v. Filek.

Italy—Tuscany. **Hewlett.**

The Road in Tuscany. A Commentary. By M. Hewlett. 2 vols. London: Macmillan & Co., 1904. Size 8 × 5½, pp. (vol. i.) xiv. and 384; (vol. ii.) xiv. and 376. *Illustrations. Price* 21*s. net. Presented by the Publishers.*

This book seems well qualified to be, as its author intends, a companion of Tuscan travel. Arranged somewhat in the fashion of the old road-books, its aim throughout has been to give prominence to the people of the country, as its best product, and themselves the producers of all that is of interest in the way of history, art, and institutions.

Mediterranean. *Petermanns M.* **50** (1904): 174-176. **Fischer.**

Aufgaben und Streitfragen der Länderkunde des Mittelmeergebiets. Von Prof. Dr. T. Fischer.

North Sea—Kattegat. *K. Svensk. Vet.-A. Handl.* **38** (No. 2) (1904): pp. 30. **Cronander.**

Om Ytström och Bottenström i Kattegatt. Af A. W. Cronander.

On the surface and bottom currents in the Kattegat.

Norway—Riings-glacier. *Norske G.S. Aarbog* **14** (1902-3): 119-124. **Reusch.**

Riingsbraeen. Af Dr. Hans Reusch. *Illustrations.*

Cf. note in the November number (p. 595).

Spain. *B.S.G. Lille* **42** (1904): 5-47. **Eustache.**

En Andalousie. Par le Dr. G. Eustache. *With Map and Illustrations.*

Sweden. *K. Svensk. Vet.-A. Handl.* **38** (No. 1) (1904): pp. 94. **Hamberg.**

Die Sommernachtfröste in Schweden, 1871-1900. Von H. E. Hamberg. *With Maps and Diagrams.*

Switzerland—Jura. **Rollier.**

Dr. Louis Rollier, in Verbindung mit Prof. Dr. P. Jaccard u. Prof. Dr. P. Godet. Das Schweizerische Juragebirge. Deutsch von H. Brunner. (Sonderabdruck aus dem "Geographischen Lexikon der Schweiz.") Neuenburg: Gebr. Attinger, 1903. Size 12 × 7½, pp. 40. *Illustrations.*

Switzerland—Lake of Geneva. **Forel.**

Prof. Dr. F. A. Forel. Der Genfersee. Deutsch von H. Brunner. (Sonderabdruck aus dem "Geographischen Lexikon der Schweiz.") Neuenburg: Gebr. Attinger, 1903. Size 11 × 7½, pp. 10. *Map and Illustrations.*

Switzerland—Lucerne Glacier. *J. of T. Victoria I.* **36** (1904): 286-296. **Hull.**

Notes on the Thickness of the Lucerne Glacier of the Post-Pliocene Period. By Prof. E. Hull. *With Plate. Also separate copy, presented by the Author.*

United Kingdom. *J. of T. Victoria I.* **36** (1904): 175-196. **Hull.**

On the Age of the last Uprise of the British Isles. By Prof. E. Hull. *With Map.*

United Kingdom—Bognor. **Morris.**

Bognor as a Health Resort. By Dr. H. C. L. Morris. Bognor: Webster & Webb, 1904. Size 7½ × 5, pp. 32. *Presented by the Author.*

United Kingdom—Coasts.

British Association for the Advancement of Science. Southport Meeting, 1903. Report on Observations on Changes in the Sea Coast of the United Kingdom. London: Offices of the Association, 1904. Size 8½ × 5½, pp. 24. *Map.*

The observations so far collected are here tabulated by Mr. J. Parkinson.

United Kingdom—Devon. **Ussher.**

The Geology of the country around Kingsbridge and Salcombe. (Explanation of Sheets 355 and 356.) By W. A. E. Ussher. (Memoirs of the Geological Survey. England and Wales, 355 and 356.) London: E. Stanford, 1904. Size 9½ × 6, pp. 82. *Illustrations. Price* 1*s.* 6*d.*

United Kingdom—Gazetteer. **Bartholomew.**

The Survey Gazetteer of the British Isles, Topographical, Statistical, and Commercial. Compiled from the 1901 census and the latest official returns. Edited by J. G. Bartholomew. With Appendices and Special Maps. London: G. Newnes, 1904. Size 10½ × 7¼, pp. 928. *Maps and Plans. Price* (*cloth*) 17*s.* 6*d. net; half-morocco*, 21*s. net. Two copies, presented by the Editor and Publisher.*

United Kingdom—Lancashire. **Tait.**

Mediæval Manchester and the Beginnings of Lancashire. By J. Tait. Manchester: The University Press; London: Sherratt & Hughes. 1904. Size 9½ × 6, pp. x. and 212. *Frontispiece and Maps. Price* 7*s.* 6*d. net. Presented by the Publishers.*

The standpoint in this book is almost purely historical, and there is no attempt to illustrate the influence of geographical factors on the course of the history. The study is, however, of value as the first attempt to discuss in a systematic way the problems connected with the origins of Manchester and the gradual process by which Lancashire attained the position of a recognized administrative county.

United Kingdom—London. **Ordish.**

London Topographical Record, Illustrated, including the Fourth Annual Report of the London Topographical Society. Edited by T. Fairman Ordish. Office of the London Topographical Society, 1903. Size 9 × 6, pp. viii. and 126. *Illustrations. Presented by the London Topographical Society.*

Contains, besides many details on the old topography of London, an article on Norden and his map of 1593.

United Kingdom—London. **Price.**

The Signs of Old Lombard Street. By F. G. Hilton Price. 1887–1902. London: The Leadenhall Press: Simpkin & Co. Size 9 × 6, pp. 208. *Plan and Illustrations. Presented by the London Topographical Society.*

United Kingdom—Scotland. **Watson.**

Place-Names of Ross and Cromarty. By W. J. Watson. Inverness: The Northern Counties Printing and Publishing Co.; London: D. Nutt. 1904. Size 9 × 6, pp. lxxxvi. and 302.

A solid piece of work, based on careful inquiry, especial care having been devoted to the ascertainment of the genuine Gaelic forms of names, by which, the writer claims, the task is raised above the sphere of conjecture, which has caused much work of the kind to lack precision.

United Kingdom—Surrey and Sussex. **Ward.**

Thorough Guide Series. Surrey [south of Epsom] and Sussex [including Tunbridge Wells]. By C. S. Ward. Third Edition—Revised. London: Dulau & Co., 1904. Size 6½ × 4¼, pp. xii. and 172. *Maps and Plans. Price* 3*s.* 6*d. net. Presented by the Publishers.*

This new edition will be welcomed by the increasing number of Londoners and others who appreciate the scenery of the southern counties.

United Kingdom—Wales. *Geolog. Mag.* **1** (1904): 504–505. **Greenly.**

The Glaciation of Holyhead Mountain. By E. Greenly.

ASIA.

Asia. *Deutsch. Rundschau G.* **26** (1904): 494–512. **Jüttner.**

Fortschritte der geographischen Forschungen und Reisen im Jahre 1903. 2. Asien. Von Dr. J. M. Jüttner.

Central Asia. *Petermanns M.* **50** (1904): 159–170. **Hedin.**

Die wissenschaftlichen Ergebnisse meiner letzten Reise. Von Dr. Sven v. Hedin. *With Map.*

China. *Rev. G.* **28** (1904): 261–269. **Gervais-Courtellemont.**

Exploration du haut Yang-tsé. Par H. Gervais-Courtellemont. *With Map and Illustrations.*

Noticed in the December *Journal* (p. 676).

China and India. *B. l'École Française d'Extrême-Orient* **4** (1904): 131–413. **Pelliot.**

Deux itinéraires de Chine en Inde à la fin du VII^e^ Siècle. Par P. Pelliot.

China—Manchuria. **Minocchi.**

Salvatore Minocchi. Per la Manciuria a Pechino. (Ottobre 1903.) Firenze: B. Seeber, 1904. Size 7½ × 5, pp. 360. *Illustrations. Presented by the Publisher.*

Chinese Empire—Mongolia. **Chalon.**

Rev. G. **28** (1904): 99–107, 163–172, 199–206, 227–236.

En Mongolie: le pays des Saïotes. Par P. F. Chalon. *With Map and Illustrations.*

Chinese Empire—Tibet. **Grenard.**

Tibet: the Country and its Inhabitants. By F. Grenard. Translated by A. Teixeira de Mattos. London: Hutchinson & Co., 1904. Size 9 × 6, pp. viii. and 374. *Map. Price* 10*s.* 6*d. net. Presented by the Publishers.*

This English translation of the most generally interesting sections of M. Grenard's important work (noticed in the *Journal* at the time of its appearance) is particularly welcome at the present time. The author has perhaps paid more attention than any recent traveller to the inhabitants of Tibet, their characteristics and social and economic conditions, etc., to which subjects nearly half the book is devoted.

Chinese Empire—Tibet. **Hedin.**

Adventures in Tibet. By Sven Hedin. London: Hurst & Blackett, 1904. Size 9 × 6, pp. xvi. and 488. *Illustrations. Price* 10*s.* 6*d. net. Presented by the Publishers.*

This book, which, though based on Dr. Hedin's larger work, has been entirely re-written for a more popular audience, is not confined to the Tibetan section of the great journey, as might be supposed from the title, but describes the whole of the routes through the Tarim basin, the Gobi, and Tibet. It is likely to find a place in many libraries where considerations of space forbid the inclusion of the two bulky volumes forming the earlier work.

Chinese Empire—Tibet. **Das.**

Sarat Chandra Das. Journeys in Tibet. Translated from the English and edited by V. Kotvich. [In Russian.] St. Petersburg, 1904. Size 8 × 6, pp. xliv. and 356. *Maps and Illustrations.*

Chinese Empire—Tibet. **Wegener.**

Tibet und die englische Expedition. Von Dr. G. Wegener. Halle a. S.: Gebauer-Schwetschke, 1904. Size 9½ × 6½, pp. 148. *Maps and Illustrations. Price* 3*m. Presented by the Publisher.* [See *ante*, p. 85.]

French Indo-China—Tongking. *T. Asiatic S. Japan* **31** (1904): 2–25. **Baelz.**

A Report on a Visit to Tonkin. By Dr. E. Baelz.

India. **Holdich.**

India. By Colonel Sir T. H. Holdich, K.C.M.G., etc. (The Regions of the World). London: H. Frowde, [1904]. Size 9½ × 6½, pp. xii. and 376. *Maps. Price* 7*s.* 6*d. net. Presented by the Publishers.* [To be reviewed.]

India. **Workman.**

Through Town and Jungle. Fourteen Thousand Miles a-wheel among the Temples and People of the Indian Plain. By Dr. W. H. Workman and F. B. Workman. London: T. Fisher Unwin, 1904. Size 10½ × 7, pp. xxiv. and 380. *Map and Illustrations. Price* 21*s. net. Presented by the Publisher.*

The special value of this work consists in the fine series of illustrations of Indian temples and other architectural features.

India. ———

The Imperial Guide to India, including Kashmir, Burma, and Ceylon. London: John Murray, 1904. Size 7½ × 5, pp. xii. and 244. *Maps and Illustrations. Price* 6*s. net. Presented by the Publisher.*

This practical and handy little guide will be a great boon to visitors to India, as it gives in small compass just the sort of information they need in regard to routes, accommodation, and objects of interest.

India. **Soboleff and Gowan.**

J.R. United Service I. **47** (1903): 300, 433, 583, 680, 794; **48** (1904): 75, 170, 255, 395, 541, 687, 817, 938, 1062.

Campaigns against India from the West and through Afghánistán. Translated

and condensed from the Russian of Major-General L. N. Soboleff. By Lieut.-Colonel W. E. Gowan. *With Map.*

India—Burma. *Records Botan. Surv. India* 3 (No. 1) (1904): pp. 142. **Gage.**

The Vegetation of the District of Minbu in Upper Burma. By Captain A. T. Gage. *With Map.* [See *ante*, p. 90.]

India—Survey Report. **Gore.**

General Report on the Operations of the Survey of India administered under the Government of India during 1902-1903. Prepared under the direction of Colonel St. G. C. Gore, C.S.I. Calcutta: 1904. Size 13½ × 8½, pp. iv., 74, and iv. *Frontispiece and Maps. Presented by the Surveyor-General of India.*

Indian Ocean—Andaman Islands. ——

Extracts from Reports and Diaries of two Reconnaissances of the country supposed to be occupied by the Jarawas, 1902. Size 13½ × 8½, pp. 26. *Illustrations. Presented by C. G. Rogers, Esq.*

Japan. **Farrer.**

The Garden of Asia: Impressions from Japan. By R. J. Farrer. London: Methuen & Co., 1904. Size 8 × 5½, pp. xii. and 296. *Price* 6*s. Presented by the Publishers.*

Not intended as a guide-book, but written with a view to giving a true general picture of a country on which, in the writer's opinion, the ordinary Englishman cherishes ideas "of a conventional and exaggerated futility."

Korea. *B.S.G. Italiana* 5 (1904): 550-574. **Rossetti.**

Impressioni di Corea. Conferenza del C. Rossetti.

Malay Archipelago—Java. **Day.**

The Policy and Administration of the Dutch in Java. By C. Day, PH.D. New York: The Macmillan Co.; London: Macmillan & Co. 1904. Size 8½ × 5½, pp. xxii. and 434. *Price* 8*s.* 6*d. net. Presented by the Publishers.*

A study of colonial methods which will be read with much interest in view of existing controversies. The writer holds that the "culture-system" led to abuses as a result of its inherent principles, though he allows that it might have been carried out according to the original plans of Van den Bosch, so as to be a blessing, and not a curse, to the people subject to it.

Malay Archipelago—Timor. **Alderwerelt.**

Tijds. Ind. Taal-, Land- en Volkenk. 47 (1904): 195-226.

Aanteekeningen over Timor en Onderhoorigheden, 1668 tot en met 1809, met eene toelichting van J. de Roo van Alderwerelt.

Malay Peninsula—Historical. *J.R. Asiatic S.* (1904): 719-723. **Gerini.**

Some Unidentified Toponyms in the Travels of Pedro Teixeira and Tavernier. By Colonel G. E. Gerini.

Russia—Caucasia. *Alpine J.* 22 (1904): 197-205. **Wigner.**

In Western Suanetia in 1903. By J. H. Wigner.

Russia—Caucasus. *Le Globe, B.S.G. Genève* 43 (1904): 94-101. **Dingelstedt.**

La Côte orientale de la mer Noire ou la Riviera russe. Par V. Dingelstedt.

Russia—Siberia. **Koulomzine.**

A.-N. de Koulomzine. Le Transsibérien. Traduit du Russe par J. Legras. Paris: Hachette et Cie., 1904. Size 10 × 6½, pp. viii. and 326. *Maps, Diagrams, and Illustrations. Price* 5*s.* 8*d.*

A valuable history of the inception and execution of the great Siberian railway project.

Turkey—Asia Minor. *B.S.G. de l'Est* 25 (1904): 5-14. **Gallois.**

Visite aux ruines gréco-romaines d'Asie Mineure. Par E. Gallois.

Turkey—Babylonia. *M.V. Erdk. Leipzig* (1903): 15-20. **Hilprecht.**

Die babylonischen Ausgrabungen der Amerikaner im Bêl-Tempel zu Nippur. Von Prof. Dr. Hilprecht.

AFRICA.

Abyssinia. **Cufino.**

La via da Assab all' Etiopia Centrale pel Golima. L. Cufino. [Napoli, 1904.] Size 9½ × 6½, pp. 6. *Presented by Prof. G. Cora.*

Africa. **Keane.**

Stanford's Compendium of Geography and Travel (New Issue). Africa. Vol. ii. South Africa. By Dr. A. H. Keane. Second Edition. London: E. Stanford, 1904. Size 8 × 5½, pp. xvi. and 672. *Maps and Illustrations. Price* 15*s. Presented by the Publisher.*

Both the text and maps have undergone careful revision in this edition. Good use has evidently been made of the current information supplied by the *Journal*, to which frequent references are made.

Africa—Trade-routes. *Deutsch. Rundschau G.* **27** (1904): 34–35. ——

Verkehrswege in Afrika. *With Map.*

Angola. *B.S.G. Lisboa* **22** (1904): 33–44, 65–77, 126–134. **Carvalho.**

Apontamentos d'uma viagem no sul d'Angola. Por F. C. Dias de Carvalho.

British East Africa—Native tribes. *J. Anthrop. I.* **34** (1904): 130–148. **Tate.**

Notes on the Kikuyu and Kamba tribes of British East Africa. By H. R. Tate. *With Map and Plates.*

Cape Colony. *T.S. African Philosoph. S.* **15** (1904): 61–83. **Rogers and Du Toit.**

The Sutherland Volcanic Pipes and their relationship to other Vents in South Africa. By A. W. Rogers and A. du Toit. *With Plans.*

Cape Colony. *T.S. African Philosoph. S.* **15** (1904): 43–59. **Schwarz.**

High-level Gravels of the Cape and the Problem of the Karroo Gold. By E. H. L. Schwarz. *With Plates.*

Cape Colony. ——

Cape of Good Hope. Department of Agriculture. Annual Report of the Geological Commission, 1903. Cape Town, 1904. Size 10 × 7½, pp. 206. *Maps and Sections.*

Central Africa. *B.S.G. Cher* **2** (1903–1904): 273–288. **Colrat.**

A travers l'Afrique de l'embouchure du Congo au Bahr-el-Ghazal (Mission Bonnel de Mézières): choses et gens de l'Afrique Centrale. Par R. Colrat (compte-rendu par P. Crochet). *With Illustrations.*

Central Africa. **Kandt.**

Caput Nili. Eine empfindsame Reise zu den Quellen des Nils. Von R. Kandt. Berlin: D. Reimer (E. Vohsen), 1904. Size 10 × 7, pp. xvi. and 538. *Maps and Illustrations. Price* 8*m. Presented by the Publisher.*

Central Africa. *Rev. Française* **29** (1904): 489–492. **Pierre.**

De l'Oubangui au Nil. Exploration Charles Pierre.

Central Africa. *Mouvement G.* **21** (1904): 457–460. **Wautees.**

Le grand "Graben" du Tanganyika et du Nil supérieur. Par A. J. Wauters. *With Map and Profile.*

Central Africa—Lake Tanganyika. *J. of T. Victoria I.* **36** (1904): 300–351. **Hudleston.**

On the Origin of the Marine (Halolimnic) Fauna of Lake Tanganyika. By W. H. Hudleston, F.R.S. *With Maps and Sections.*

See note in the Monthly Record, p. 91.

Egypt. *Petermanns M.* **50** (1904): 179–187. **Steindorff.**

Eine archäologische Reise durch die Libysche Wüste zur Amons-Oase Siwe. Von Prof. Dr. G. Steindorff. *With Map.*

The journey was made in 1899–1900 in company with Baron von Grünau (*Journal*, vol. 17, p. 190).

Erythrea and Egyptian Sudan. **Schoenfeld.**

Erythräa und der Ägyptische Sudân. Auf Grund eigener Forschung, an Ort und Stelle dargestellt von Prof. Dr. E. D. Schoenfeld. Berlin: D. Reimer (E. Vohsen), 1904. Size 10 × 7, pp. 246. *Plates. Price* 8*m. Presented by the Publisher.*

Based on the writer's personal observations. The illustrations are unusually good.

French Congo. *Rev. Colon.* (1904): 637–641. **Villelongue.**

De la Sangha à l'Oubangui, par Bayanga, Lopi, la rivière Mokala et Imessé. Itinéraire suivi par M. P. de Villelongue, en Novembre et Décembre, 1902. *Map.*

The Mokala, a western tributary of the Ubangi, approaches within a few miles of the Sangha, and is navigable for canoes throughout.

German South-west Africa. *Deutsch. Kolonialzeitung* **21** (1904): 355–356. **Passarge.**
Das Kaukaufeld, ein Rückzugsgebiet der Herero. Von Dr. S. Passarge.

Ivory Coast. *Rev. Colon.* (1904): 621–636. **Cartron.**
Mission topographique du Sanwi (Côte d'Ivoire). Par M. Cartron.

Kamerun. *Globus* **86** (1904): 149–152. **Hutter.**
Der Elefantensee, ein Urwaldidyll in Nordkamerun. Von Hauptmann a. D. Hutter. *With Illustrations.*

Kamerun. *M.G. Ges. Jena* **22** (1904): 21–24. **Kurge.**
Ein Ausflug ins Land der Banyang.

Kamerun. **Bauer.**
Die Deutsche Niger-Benue-Tsadsee-Expedition 1902–1903. Von F. Bauer. Berlin: D. Reimer (Ernst Vohsen), 1904. Size 10½ × 7, pp. viii. and 182. *Maps and Illustrations. Price* 4*m. Presented by the Publisher.*
Some account of this expedition was given in the *Journal* for November, 1903 (p. 568).

Kamerun. **Esch, and others.**
Beiträge zur Geologie von Kamerun. Von Dr. E. Esch, Dr. F. Solger, Dr. M. Oppenheim, Prof. Dr. O. Jaekel. Stuttgart: E. Schweizerbart (E. Nägele), 1904. Size 9 × 6½, pp. xiv. and 298. *Maps and Illustrations. Presented by the Kolonial-abteilung des Auswärtigen Amts, Berlin.*

Natal. *Minutes of P.I. Civil Engineers* **157** (1904): 319–329. **Humby.**
Irrigation in the Native Reserves of the Colony of Natal. By A. J. Humby. *With Map and Sections.*

Niger. *G.Z.* **10** (1904): 438–450. **Kleist.**
Die wirtschaftliche Bedeutung des Niger. Von Oberstleutnant a. D. v. Kleist.

Nigeria—Geology. *Geolog. Mag.* **1** (1904): 290–291. **Lelean.**
An Eocene outcrop in Central Africa. By Captain P. S. Lelean. *With Map.*
In a subsequent paper, Dr. F. A. Bather describes the Eocene echinoids brought by Captain Lelean from Sokoto. (Cf. *Journal* for November, p. 522.)

Nile. *Scottish G. Mag.* **20** (1904): 474–489, 543–544. **Waite.**
The Annual Rise and Fall of the Nile. By P. C. Waite. *With Diagrams.*

Portuguese Guinea. *Deutsch. Rundschau G.* **27** (1904): 5–13. **Wagner.**
Portugiesisch-Guinea. Land und Leute. Von R. Wagner. *With Map and Illustrations.*

Sahara—Geology. **Besset and Flamand.**
Renseign. Colon., Comité l'Afrique Française (1904): 1–15, 62–68.
D'In-Salah à Amguid. Par Lieut. Besset and G. B. M. Flamand. *With Map and Illustrations.*

Sahara and Sudan. **Leroy-Beaulieu.**
Le Sahara, le Soudan et les Chemins de fer Transsahariens. Par P. Leroy-Beaulieu. Paris: Guillaumin et Cie., 1904. Size 9 × 6, pp. xiv. and 494. *Map. Price* 8 *fr.*
The author, who has long been known as one of the most vigorous champions of railway communication across the Sahara, here gives a valuable summary and discussion of the whole subject, with copious information on the course of exploration and the nature of the Sahara.

Sahara—Telegraph. *Renseign. Colon., Comité l'Afrique Française* (1904): 185–194. **Nou.**
Le Transsaharien télégraphique. Par Capitaine Nou. *With Map.*

Sahara—Tuat. **Niéger.**
Renseign. Colon., Comité l'Afrique Française (1904): 170–177, 195–203.
Le Touat. Par Lieutenant Niéger.

South Africa. **Theal.**
History of South Africa from 1795 to 1828. Ditto, from 1828 to 1846, and from 1846 to 1860. By G. McCall Theal. London: Sonnenschein & Co., 1903–4. 3

vols. Size 9 × 6, pp. xviii. and 480, xiii. and 504, xiv. and 478. *Maps. Price 7s. 6d. each vol. Presented by the Publishers.*

Part of a new edition of Dr. Theal's great work, with considerable additions, brought out at a price which will put it within the reach of a wide circle of readers. The vols. are not numbered, and a separate title is given to each, but the chapters run consecutively throughout.

South Africa—Kalahari. **Passarge.**

Die Kalahari, Versuch einer physisch-geographischen Darstellung der Sandfelder des südafrikanischen Beckens. Von Dr. S. Passarge. Herausgegeben mit Unterstützung der Königlich Preussischen Akademie der Wissenschaften. Text, and Maps (separate). Berlin: D. Reimer (Ernst Vohsen), 1904. Size 11½ × 8, pp. xvi. and 822. *Illustrations. Price* 80*m. Presented by the Publisher.* [To be reviewed.]

Transvaal. ——

Geological Survey of the Transvaal. Report for the year 1903. Pretoria, 1904. Size 13½ × 8½, pp. 48. *Maps and Illustrations. Price 7s. 6d. Presented by the Secretary of State for the Colonies.*

Uganda. ——

Africa. No. 12 (1904). General Report on the Uganda Protectorate for the year ending March 31, 1904. London: Eyre & Spottiswoode, 1904. Size 13½ × 8½, pp. 40. *Price* 4½*d.* [See *ante*, p. 92.]

Victoria Nyanza. **Lyons.**

On the Variations of Level of Lake Victoria. By Captain H. G. Lyons. Being Appendix III. of a Report upon the Basin of the Upper Nile, with proposals for the improvement of that river. By Sir W. Garstin, G.C.M.G. Cairo, 1904. Size 13½ × 9, pp. 20. *Diagram.*

Wadai. **Julien.**

Renseign. Colon., Comité l'Afrique Française (1904): 51-62, 87-92, 108-110, 138-143.

Le Dar-Ouadaï. Par Capitaine Julien.

West Africa. *Globus* **86** (1904): 157. ——

Die Arbeiten der Jola—Tschadsee Grenz-expedition.

NORTH AMERICA.

Alaska. *J. Franklin I.* **158** (1904): 289-310, 353-366. **Abercrombie.**

The Copper River Country, Alaska. By Major W. R. Abercrombie. *With Map and Illustrations.*

Alaska. *B.U.S. Geolog. Surv.*, No. **229** (1904): pp. 62. **Collier.**

The Tin Deposits of the York region, Alaska. By A. J. Collier. *With Maps and Illustrations.*

Canada. **Buron.**

E. J. P. Buron. Les richesses du Canada, Préface de G. Hanotaux. Paris: E. Guilmoto, [*not dated*]. Size 9 × 6, pp. xiv. and 368. *Map. Price* 7 *fr.* 50.

A careful study of the economic resources of Canada.

Canada—Historical. *T.R.S. Canada* **9** (Sec. II.) (1903): 15-28. **Burpee.**

The Lake of the Woods Tragedy. By L. J. Burpee. *With Map.*

Brings together all the available evidence regarding the massacre of a French party by the Sioux on the Lake of the Woods in 1736.

Canada—New Brunswick. **Ganong.**

B. Nat. Hist. S. New Brunswick **5** (1904): 179-241.

Notes on the Natural History and Physiography of New Brunswick. By W. F. Ganong. *With Maps and Illustrations.*

This instalment includes papers on the geological history of certain rivers, on the highest land in New Brunswick, etc.

Canada—Rupert's Land. *T.R.S. Canada* **9** (Sec. II.) (1903): 135-144. **Bryce.**

Intrusive Ethnological Types in Rupert's Land. By Rev. Dr. G. Bryce.

Mexico. **Bonaparte and others.**

Le Mexique au début du XX^e^ Siècle. Par MM. le Prince R. Bonaparte, L. Bourgeois, J. Claretie, d'Estournelles de Constant, A. de Foville, H. Gomot, O. Gréard,

A. Haller, C. Krantz, M. Lagrave, L. de Launay, P. Leroy-Beaulieu, E. Leyasseur, le général Niox, A. Picard, E. Reclus. 2 vols. Paris: C. Delagrave, [1904]. Size 12 × 8, pp. (vol. i.) 394; (vol. ii.) 374. *Maps. Presented by the Publisher.*

The most complete and systematic description of Mexico and its people that has yet appeared.

Mexico. **Biorklund.**

Live-Stock in Mexico. Foreign Office, Miscellaneous, No. 614, 1904. Size 10 × 6½, pp. 42. *Price* 2½*d.*

North America—Early Travel. **Hennepin and Thwaites.**

A New Discovery of a Vast Country in America. By Father Louis Hennepin. Reprinted from the second London issue of 1698, with facsimiles of original title-pages, maps, and illustrations, and the addition of Introduction, Notes, and Index. By R. G. Thwaites. 2 vols. Chicago: A. C. McClurg & Co., 1903. Size 8½ × 6½, pp. lxiv. and 712. *Price* $6.00 *net.*

An excellent reprint of this famous old work.

United States. **Colquhoun.**

Greater America. By A. R. Colquhoun. London and New York: Harper & Brothers, 1904. Size 9 × 6, pp. x. and 436. *Portrait and Maps. Price* 16*s. Presented by the Publishers.* [Reviewed *ante*, p. 88.]

United States—Economic Geology. **Emmont, Hayes, and others.**

B. United States Geolog. Surv., No. 225 (1904): pp. 528.

Contributions to Economic Geology, 1903. *With Maps, Plans, etc.*

United States—Geological Survey. ———

B. United States Geolog. Surv., No. 227 (1904): pp. 206.

The United States Geological Survey, its Origin, Development, Organization, and Operations. *With Maps and Illustrations.*

United States—Gypsum. **Adams and others.**

B. United States Geolog. Surv., No. 223 (1904): pp. 130.

Gypsum Deposits in the United States. By G. I. Adams and others. *With Maps and Illustrations.*

United States—Historical. **Chittenden.**

History of Early Steamboat Navigation on the Missouri River. Life and Adventures of Joseph La Barge. By H. M. Chittenden. 2 vols. New York: F. P. Harper, 1903. Size 9½ × 6½, pp. xiv. and 462. *Maps and Illustrations. Price* 25*s.*

An attempt to weave the story of steamboat navigation on the Missouri, one of the most important factors in the opening up and development of the west, around the biography of its most distinguished personality, whose memoirs were personally dictated to the author only some half-dozen years ago.

United States—Mississippi. *T.R.S. Canada* **9** (Sec. I.) (1903): 3–44. **Sulte.**

Découverte du Mississipi en 1659. Par B. Sulte.

Refers to the journeys of Chouart and Radisson, the latter of whom M. Sulte considers to have reached the true Mississippi, though this is generally considered doubtful.

United States—Mississippi River. *P. American Philosoph. S.* **43** (1904): 71–96. **Haupt.**

The Mississippi River Problem. By L. M. Haupt. *With Map.*

On methods of controlling floods.

United States—Nevada and California. **Spurr.**

B. United States Geolog. Surv., No. 208 (1903): pp. 230.

Descriptive Geology of Nevada south of the Fortieth Parallel and adjacent portions of California. By J. E. Spurr. *With Maps and Illustrations.*

United States—New York—Hudson River. **Davis.**

B. American G.S. **36** (1904): 557–559.

The Hudson River described by W. M. Davis.

United States—Ohio. **Flynn.**

The Natural Features and Economic Development of the Sandusky, Maumee, Muskingum, and Miami Drainage Areas in Ohio. By B. H. Flynn and M. S. Flynn. (United States Geological Survey, Water-Supply and Irrigation Paper No. 91.) Washington, 1904. Size 9½ × 6, pp. 130. *Maps and Diagrams. Presented by the U.S. Geological Survey.*

United States—South Dakota. **Todd and Hall.**

Geology and Water Resources of part of the Lower James River Valley, South Dakota. By J. E. Todd and C. M. Hall. (United States Geological Survey, Water-Supply and Irrigation Paper No. 90.) Washington, 1904. Size 9½ × 6, pp. 48. *Maps and Illustrations. Presented by the U.S. Geological Survey.*

United States—Texas. **Gannett.**

B. United States Geolog. Surv., No. 224 (1904): pp. 178.

A Gazetteer of Texas (Second Edition). By H. Gannett. *With Maps.*

Contains a valuable introductory sketch.

United States—Virginia. **Eckenrode.**

The Political History of Virginia during the Reconstruction. By H. J. Eckenrode. (Johns Hopkins University Studies, Series xxii., Nos. 6-7-8.) Baltimore, 1904. Size 9½ × 6, pp. 128 and 70.

CENTRAL AND SOUTH AMERICA.

Andes. *Globus* **86** (1904): 91-93. **Goll.**

Das Leuchten der Vulkane in den Südamerikanischen Anden. Von Dr. F. Goll.

On a phenomenon presenting the appearance of lightning.

Bolivia. **Armentia.**

Lenguas Americanas (Sección Bolivia). Los Indios Mosetenes y su lengua. Noticias generales y vocabularios por el P. Fr. N. Armentia. Con introducción de S. A. Lafone Quevedo. Buenos Aires, 1903. Size 10½ × 7, pp. 126. *Presented by Sr. S. A. Lafone Quevedo.*

Reprinted from the *Anales de la Soc. Científica Argentina.*

Bolivia. **Calderón.**

Abdón Calderón. Indice sinoptico de Leyes, Decretos, Resoluciones y Ordenes administrativas dictadas desde 1825 hasta 1900 inclusive en el ramo de Hacienda é Industria. La Paz, 1904. Size 9½ × 7, pp. 380.

Bolivia. *Petermanns M.* **50** (1904): 188-195. **Jerrmann.**

Reise in die Gummidistrikte Ost-Boliviens. Von Hpt. Jerrmann. *With Map.*

Central and South America. ——

Monthly B. Internat. Bureau American Reps. **17** (1904): 138-205.

Latin America in 1903—A Review.

Chile and Argentina. **Holdich**

The Countries of the King's Award. By Col. Sir T. H. Holdich. London: Hurst & Blackett, 1904. Size 9 × 5½, pp. xvi. and 420. *Map and Illustrations. Price 16s. net. Presented by the Author.* [To be reviewed.]

Ecuador. *M.V. Erdk. Leipzig* (1903): 36-39. **Meyer.**

Reise im Hochland von Ecuador. Von Prof. Dr. H. Meyer.

Falkland Islands. **Vallentin.**

Mem. Manchester Lit. and Philosoph. S. **48** (No. 23) (1903-1904): pp. 48.

Notes on the Falkland Islands. By R. Vallentin. *With Plates.*

Deals chiefly with the natural history of the group (see *ante*, p. 96).

Guadeloupe. *B. American G.S.* **36** (1904): 513-530. **Hovey.**

The Grande Soufrière of Guadeloupe. By E. O. Hovey. *With Map and Illustrations.*

Honduras. **Moe.**

Honduras: Geographical Sketch, Natural Resources, Laws, Economic Conditions, Actual Development, Prospects of Future Growth. Edited and compiled for the International Bureau of the American Republics by A. K. Moe. 1904. Washington, 1904. Size 9 × 6, pp. 252. *Maps and Illustrations. Presented by the Bureau.*

Paraguay. *Deutsch. Rundschau G.* **27** (1904): 23-31. **Fischer-Treuenfeld.**

Kolonie Hohenau in Paraguay. Von R. von Fischer-Treuenfeld.

Peru. *National G. Mag.* **15** (1904): 311-323. **Calderon.**

Peru—Its Resources, Development, and Future. By A. A. Calderon.

Venezuela. *M.V. Erdk. Leipzig* (1903): 33–36. **Passarge.**
Reise im Gebiet des Orinoko. Von Dr. S. Passarge.

AUSTRALASIA AND PACIFIC ISLANDS.

Australia—Ethnology. **Howitt.**
The Native Tribes of South-East Australia. By A. W. Howitt, D.SC. London: Macmillan & Co., 1904. Size 9 × 6, pp. xx. and 820. *Maps and Illustrations. Price* 21*s. net. Presented by the Publishers.*

Hawaii. *Deutsch. Rundschau G.* **27** (1904): 1–5. **Kuntze.**
Der Kilauea auf Hawaii als Vulkan erloschen. Von Dr. O. Kuntze.

New Zealand. *J. of T. Victoria I.* **36** (1904): 129–147. **Boord.**
On the Hot Lakes District, New Zealand. By Miss Hilda Boord. *With Illustration.*

Pacific Ocean. *B. American G.S.* **36** (1904): 530–534. **Littlehales.**
The Disproof of the Existence of Reed or Redfield Rocks. By G. W. Littlehales. *With Chart.*
These rocks were supposed to exist some 700 miles west of San Francisco.

Queensland. ———
Queensland. Report of the Government Statistician on Agricultural and Pastoral Statistics for 1903. [Brisbane], 1904. Size 13½ × 8½, pp. 68. *Presented by the Government Statistician of Queensland.*

Queensland—Torres Strait. *Globus* **86** (1904): 177–181. ———
Die Bewohner der westlichen Torresstrasse-Inseln. *With Illustrations.*

POLAR REGIONS.

Antarctic—German Expedition. **Drygalski.**
Zum Kontinent des eisigen Südens. Von Erich von Drygalski. Deutsche Südpolar-expedition, Fahrten und Forschungen des *Gauss* 1901–1903. Berlin: G. Reimer, 1904. Size 11 × 8, pp. xiv. and 668. *Maps and Illustrations. Price* 18*m. Presented by the Publisher.* [To be reviewed.]

Antarctic—Swedish Expedition. **Nordenskjöld and others.**
"Antarctic." Zwei Jahre in Schnee und Eis am Südpol. Von Dr. O. Nordenskjöld, J. G. Andersson, C. A. Larsen, und C. Skottsberg. Nach dem schwedischen Original ins deutsche uebertragen von M. Mann. 2 vols. Berlin: D. Reimer (E. Vohsen), 1904. Size 6½ × 7, pp. (vol. i.) xxiv. and 374; (vol. ii.) vi. and 408. *Maps and Illustrations. Price* 12*m. Presented by the Publisher.* [To be reviewed.]

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Geomorphology. **Suess.**
The Face of the Earth (Das Antlitz der Erde). By E. Suess. Translated by H. B. C. Sollas, under the direction of W. J. Sollas. Vol. i. Oxford: The Clarendon Press, 1904. Size 10 × 7, pp. xii. and 604. *Maps and Illustrations. Price* 25*s. net. Presented by the Publishers.* [To be reviewed.]

Physical Geography. **Brigham.**
Twentieth Century Text-Books. Students' Laboratory Manual of Physical Geography. By Prof. A. P. Brigham. New York: D. Appleton & Co., 1905 [1904]. Size 8 × 5½, pp. vi. and 154. *Maps and Illustrations. Presented by the Publishers.*

Forms a valuable supplement to the 'Introduction to Physical Geography,' which appeared in 1902. It will aid both teacher and student in the prosecution of the practical work, which is of so much importance, but has been far too much neglected in the past.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Economic Geography. **Friedrich.**
Allgemeine und Spezielle Wirtschaftsgeographie. Von Dr. E. Friedrich. Leipzig: G. J. Göschen, 1904. Size 9 × 6, pp. 370. *Maps. Presented by the Publisher.*
Reviewed in the November number, p. 581.

Economic Geography. **Oppel.**

Natur und Arbeit. Eine allgemeine Wirtschaftskunde von Prof. Dr. A. Oppel. 2 vols. Leipzig und Wien: Bibliographisches Institut, 1904. Size 10½ × 7, pp. (vol. i.) x. and 352; (vol. ii.) x. and 458. *Maps and Illustrations. Price (each vol.)* 10*s.*

An important work on the physical bases of human industries.

Historical—Cartography. **Porena.**

Schiarimenti intorno al passaggio del primato cartografico dall' Italia ai Paesi Bassi nel secolo XVI. Memoria del Prof. F. Porena. Size 9½ × 6½, pp. 16. *Presented by Prof. G. Cora.*

Historical—Compass. **Posteraro.**

Origine Italiana della Bussola Nautica inventata dal Veronese Salomone Ireneo Pacifico. Dott. L. Posteraro. Size 9½ × 6½, pp. 20. *Presented by Prof. G. Cora.*

Paper read at the Fifth Italian Geographical Congress.

Mankind. *G.Z.* **10** (1904): 417–438. **Chalikiopoulos.**

Geographische Beiträge zur Entstehung des Menschen und seiner Kultur. Von Dr. L. Chalikiopoulos.

Settlements. *G. Anzeiger* **5** (1904): 121–123. **Fischer.**

Die Siedelungsgeographie, das natürliche Arbeitsfeld unserer germanistisch-historisch gebildeten Erdkundelehrer, im Anschluss an Otto Schlüter "Die Siedelungen im nordöstlichen Thüringen." Von H. Fischer.

GENERAL.

America and Africa. *Deutsch. Rundschau G.* **26** (1904): 534–558. **Jüttner and Umlauft.**

Fortschritte der geographischen Forschungen und Reisen im Jahre 1903. 3. Amerika. Von Dr. J. M. Jüttner. 4. Afrika. Von Dr. F. Umlauft.

British Empire. **George.**

A Historical Geography of the British Empire. By H. B. George. London: Methuen & Co., 1904. Size 8 × 5½, pp. xii. and 312. *Map. Price* 3*s.* 6*d. Presented by the Publishers.* [To be reviewed.]

Educational—Orientation. *G. Anzeiger* **5** (1904): 171–175. **Geissler.**

Osten und Westen. Von Dr. K. Geissler.

Exploration. **Williams.**

The Romance of Modern Exploration, with descriptions of curious customs, thrilling adventures, and interesting discoveries of explorers in all parts of the world. By A. Williams. London: Seeley & Co., 1905 [1904]. Size 8 × 5½, pp. 384. *Illustrations. Price* 5*s. Presented by the Publishers.*

This does not profess to give a complete history, even of the most notable exploring work in modern times, but is rather a collection of striking episodes in that history. The writer has studied the original authorities with evident care, and his facts are therefore more accurate than is often the case in popular works of the kind.

Italian Geographical Society. **Dalla Vedova.**

Prof. G. Dalla Vedova. La Societa Geografica Italiana e l'opera sua nel secolo XIX. Roma, 1904. Size 10 × 6½, pp. 92. *Illustrations. Presented by Prof. G. Dalla Vedova.*

Medical Geography—Sleeping Sickness. **Lankester.**

Quarterly Rev. **200** (1904): 113–138.

The Sleeping Sickness. By E. Ray Lankester, F.R.S. *With Illustrations.*

Travel. **Pinnock.**

Wander-Years Round the World. By J. Pinnock. London: T. Fisher Unwin, 1904. Size 9½ × 6, pp. xvi. and 350. *Maps and Illustrations. Price* 21*s. net. Presented by the Publisher.*

A popular work descriptive of Travel in the West Indies, Mexico, the Western United States, Hawaii, Japan, China, Australasia, Ceylon, India, and British East Africa. The writer has naturally nothing very new to say, but the book may be appreciated by those who desire information on these countries in not too serious a form. It is well illustrated by photographs and maps.

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S

EUROPE.

England and Wales. **Ordnance Survey.**

ORDNANCE SURVEY OF ENGLAND AND WALES:—Sheets published by the Director-General of the Ordnance Survey, Southampton, from November 1 to 30, 1904.

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(*E. Stanford, London Agent.*)

Germany. **Königl. Preuss. Landes-Aufnahme.**

Karte des Deutschen Reiches. Scale 1:100,000 or 1·6 stat. mile to an inch. Sheet 313, Oschersleben. Herausgegeben von der Kartogr. Abtheilung der Königl. Preussische Landes-Aufnahme, 1904. *Price* 1.50*m. each sheet.*

ASIA.

Chinese Empire. **Johnston.**

Chinese Empire. Scale 1:3,041,000 or 48 stat. miles to an inch. Constructed and drawn by W. & A. K. Johnston, Ltd. 4 sheets. Edinburgh and London: W. & A. K. Johnston, Ltd. *Presented by the Publishers.*

This is a highly-coloured general map of the Chinese Empire in four sheets. It is boldly executed, and when the sheets are joined in one and mounted on rollers, it will be useful as a wall map for reference in office or library. Free ports and mission stations are clearly indicated; railways in operation and under construction are shown. As regards the latter, however, there is no indication of the Hankau to Canton line, and the line to Kirin is shown as open, which is not the case.

AFRICA.

Congo State. **Intelligence Division, War Office.**

Map of the Congo Free State. Scale 1 : 4,000,000 or 63 stat. miles to an inch. London: Intelligence Division, War Office, 1904. *Price* 6*s*. *Presented by the Director of Military Operations.*

A useful general map of the Congo Free State, on one sheet, compiled from the latest information, and printed in colours.

Egypt. **Survey Department, Cairo.**

Topographical Map of Giza Province. Scale 1 : 10,000 or 6·3 inches to a mile. Sheets: S.E., Nos. 16–5, 16–6, 17–5, 17–6, 18–4, 19–5, 20–5, 21–5. Cairo: Survey Department, Public Works Ministry, 1904. *Presented by the Director-General, Survey Department, Cairo.*

South Africa. **Johnston.**

Commercial Map of South Africa. Scale 1 : 1,267,000 or 20 stat. miles to an inch. 4 sheets. Edinburgh and London: W. & A. K. Johnston, Ltd. *Presented by the Publishers.*

A large-scale wall map of South Africa, boldly printed in colours, suitable for offices and libraries. It is in four sheets, but can be mounted on one. The political boundaries are unnecessarily pronounced, and in fact, as is often the case with such maps, the physical features are to a great extent obscured by them. A general map of Africa, and a plan of the environs of Cape Town, Johannesburg, and Durban and Pietermaritzburg are given as insets.

South Africa. **"South Africa."**

The Railway Map of South Africa. Scale 1 : 4,000,000 or 63 stat. miles to an inch. Revised to date and published by authority at the offices of "South Africa," Winchester House, London, 1905. *Presented by the Publishers.*

Tunis. **Service Géographique de l'Armée, Paris.**

Carte de la Tunisie. Scale 1 : 100,000 or 1·6 stat. mile to an inch. Sheet No. xliii., Sidi Nasseur Allah. Paris: Service Géographique de l'Armée, [1904]. *Price* 1.50*f. each sheet.*

AMERICA.

United States. **Bond.**

United States, including Territories and Insular Possessions, showing the extent of the Public Surveys, Indian, Military and Forest Reservations, Railroads, Canals, National Parks, and other details. Scale 1 : 2,344,320 or 37 stat. miles to an inch. Compiled under the direction of Frank Bond, and corrected to June 30, 1903. Washington, D.C.: Department of the Interior, General Land Office: William A. Richards, Commissioner.

GENERAL.

World. **Hartleben.**

A. Hartleben's Volks-Atlas enthaltend 72 Karten in Einhundert Kartenseiten. Vierte-Auflage. Parts 18 and 19. Vienna and Leipzig: A. Hartleben, [1904]. *Price* 50 *pf. each part.*

These two parts contain the following maps: No. 5, The World in Hemispheres; No. 56, Holland, Belgium, and Luxemburg; No. 59, Denmark and Iceland; No. 73, Asiatic Russia; No. 74, Japan; No. 78, Indo-China; No. 84, Western Sudan; No. 85, Eastern Sudan.

World. **Petrie and Schokalsky.**

Marcks' Large General Table Atlas. Edited by Prof. E. J. Petrie and Colonel J. de Schokalsky. Part 10. St. Petersburg: A. F. Marcks, 1904. [In Russian.] *Presented by the Publisher.*

This part contains plates: No. 30, Sheet 16*a* of a map of European Russia, on the scale of 1 : 2,000,000; No. 34, map of Elsass-Lothringen and North-East France, on the scale of 1 : 1,000,000; No. 37, map of Austria-Hungary, on the scale of 1 : 2,750,000; No. 42, map of Spain and Portugal, on the scale of 1 : 2,750,000.

World. **Schrader.**

L'Année Cartographique. Supplément annuel á toutes les publications de Géographie et de Cartographie. Dressé et rédigé sous la direction de F. Schrader. Quatorzième année contient les modifications géographiques et politiques des années 1903–1904. Paris: Hachette et Cie., 1904. *Price* 3*f.*

M. Schrader's useful publication, 'l'Année Cartographique,' has now reached its

fourteenth year of issue. In its general design and arrangement the present number is similar to the previous ones, and contains a brief account of the more important geographical changes that have taken place in the world during the years 1903–1904. There are three sheets, one devoted to Asia, another to Africa, and the third to America. Each of the sheets contains several maps with descriptive letterpress on the back. The sheet devoted to Asia contains the following maps: Asia, showing railway development; Lieut. G. Grillières and M. Gervais Courtellemont's journeys in Yunnan and the bend of the Yang-tse Kiang; and Dr. Karl Futterer's work in North-Eastern Tibet. The African sheet contains a map of the Northern Sahara from recent explorations; M. Chevalier and Captain Lenfant's explorations in the Lake Chad region and the Cameroons; a map of Southern Ethiopia, showing the journeys and explorations of Baron von Erlanger, Count Wickenburg, and Mr. A. F. Butter; and a small general sketch of French West Africa, showing the new administrative divisions. The sheet dealing with America contains altogether five maps: the new frontier between Brazil and Bolivia; the recent Arctic explorations of Commander Peary and Mr. D. T. Hanbury; routes of Créqui Montfort ond Sénéchal de la Grange in the Argentine Republic and Bolivia; and the new Alaska-British Columbia boundary. It will thus be seen that a great deal of ground is covered in the three sheets, and the summaries given must necessarily be brief. It is, however, somewhat surprising to find no mention of the Antarctic regions, especially as so much attention has been paid to that part of the world lately.

World. **Stieler.**

Neue, neunte Lieferungs-Ausgabe von Stielers Hand-Atlas. 100 Karten in Kupferstich herausgegeben von Justus Perthes' Geographischer Anstalt. 37 and 38 Lieferung. Gotha: Justus Perthes. *Price 60 pf. each part.*

These two parts are in one cover, and contain the following maps: No. 50, Balkan Peninsula, on the scale of 1 : 3,700,000, by B. Domann; No. 59, Asia Minor, Syria, etc., on the scale of 1 : 3,700,000, by H. Habenicht; Nos. 99 and 100, Sheets 5 and 6 of a map of South America, on the scale of 1 : 7,500,000, by H. Habenicht.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during September and October, 1904. *Presented by the Hydrographic Department, Admiralty.*

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Charts Cancelled.

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571	Blunden harbour. Plan on this sheet	New plan. Blunden harbour	3448
555	Goletas channel, etc.	New plans. Goletas and New channels	3430
2067	Bull harbour. Plan on this sheet	New plan on sheet	3443
2595	Port Sorsogon. Plan on this sheet	New chart. Batan island to S. Bernardino island, etc.	3368
139	Northern entrance to Hirado-no-seto, etc.	New plan. Ikitsuki jima to Taka shima, etc.	139
3199	Allardyce harbour. Plan on this sheet.	New plan on chart	3439
1384	Uvea bay. Plan on this sheet.	New plan. Uvea atoll and Beautemps-Beaupré island	3445

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Charts that have received Important Corrections.

No. 1188, The World:—Coal and telegraph chart. 2213, England, south coast:—Teignmouth. 1776, Færoe islands:—Tranjisvaag. 3159, Norway:—Torbiornskier to Jœlöen. 3160, Norway:—Torbiornskier to Rauö. 2300, Baltic. Gulf of Bothnia:—Sheet V.: Stiernö point to Fiäderag, etc. 2302, Baltic sea. Sheet VII.: Tome point round the head of the gulf to Tauvö. 3345, France, west coast:—Chenal du Four. 274, North Polar chart:—Atlantic side. 278, North Polar chart:—Pacific side. 2740, Iceland and the Færoe islands. 2976, Iceland:—Snefells Jökel to North cape. 2977, Iceland:—North cape to Sigle fiord. 275, America, north coast:—Smith sound, Kennedy and Robeson channels. 2564, United States America, east coast:—Delaware river (Sheet 2). 528, South America. Sheet IV.: Maranham to Pernambuco. 1911, United States, west coast:—Approach to Juan de Fuca strait. 2908, Africa, south coast:—Port Natal entrance. 2757, Banka strait to Singapore. 941*a*, Eastern archipelago, western portion. 941*b*, Eastern archipelago, western portion. 2637, Celebes:—Strait of Makassar, south part. 1466, China, east coast:—Hongkong, Fotaumun pass. 2409, West coast of Formosa and Pescadores channel. 913, Korea, west coast:—Mackau group to Clifford islands. 104, Korean archipelago, southern portion. 3365, Korea south-west coast:—Port Hamilton to Mackau group. 980, Caroline islands.

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Chile. **Chilian Hydrographic Office.**

Chilian Hydrographic Charts. Nos.: 94, Puerto Condor i Bahia Sholl; 95, Canales de entrada de la Bahia Jente Grande i Bahia Jente Grande; 102, Bahia Tic-toc i Puertos Auchemo i Yelcho; 103, Estuario i Canal Baker; 104, Canal Messier, Puertos en el Estuario Baker; 105, Puerto Zapallar i Bahia de Papudo; 114, Bahia de Quintero. Valparaiso: Oficina Hidrografica, Marine de Chile, 1903–4. *Presented by the Chilian Hydrographic Office.*

North Atlantic and Mediterranean. **Meteorological Office.**

Pilot Chart of the North Atlantic and Mediterranean for December, 1904. London: Meteorological Office, 1904. *Price* 6d. *Presented by the Meteorological Office, London.*

North Pacific. **U.S. Hydrographic Office.**

Pilot Chart of the North Pacific Ocean for December, 1904. Washington: U.S. Hydrographic Office, 1904. *Presented by the U.S. Hydrographic Office.*

South Atlantic. **Meteorological Office.**

Monthly Wind-Charts of the South Atlantic Ocean. London: Hydrographic Office, 1904. *Price* 7*s*. *Presented by the Meteorological Office.*

This atlas consists of a series of twelve wind-charts—one for each month—of the South Atlantic ocean, with the eastern part of the South Pacific ocean which have been prepared by the Marine Branch of the Meteorological Office. Lines of equal barometric pressure and air-temperature are drawn from observations made simultaneously with those of the wind. The data from which the charts have been drawn consists of records obtained from nearly 3300 logs kept for the office by voluntary observers in the Royal Navy and the Mercantile Marine, supplemented by information obtained from about 1000 logs of H.M. ships, lent by the Admiralty for the purpose. A table of the mean rainfall for each month for twenty-four stations is given with other information at the commencement of the Atlas.

PHOTOGRAPHS.

British East Africa. **Brooke.**

Thirteen photographs of British East Africa, taken by J. W. Brooke, Esq. *Presented by J. W. Brooke, Esq.*

These little kodak photographs were taken by Mr. Brooke during a journey he made through the region to the north of Mount Elgon and Lake Rudolf in the years 1903–4.

(1) A volcanic bubble near Nakuro station; (2) Basalt cliffs south of Lake Naivasha; (3) The Naivasha zebra farm; (4) A pair of sixty-pound tusks, Naivasha; (5) Masai headdress of small bird-skins; (6) A donkey bogged; (7) Bush on the foot-hills of Elgon; (8) Karamoja tribe; (9) Crossing the Kabush, southern Abyssinia; (10) A camp on Lake Rudolf; (11) A Turkhana bull, Lake Rudolf; (12) My first elephant; (13) Our fighting force.

California. **Stark.**

Twenty photographs of the Yosemite Valley, California, taken by W. Emery Stark, Esq. *Presented by W. Emery Stark, Esq.*

The beautiful scenery of the Yosemite valley is well known, and has often been photographed. These views are decidedly typical, and form a welcome addition to our collection.

(1–4) Views in the Yosemite valley; (5) Village in the Yosemite valley; (6) The Bridal falls; (7 and 8) The Nevada falls; (9) Distant view of the Nevada and Vernal falls; (10) General view from Glacier point; (11 to 13) The Mirror lake; (14 and 15) The Merced river; (16) The Yosemite valley; (17) View from Inspiration point; (18 and 19) The Wawona forest; (20) Our mountain cavalcade.

Fiji and Samoa Islands. **Stark.**

Fifty-five photographs of the Fiji and Samoa islands, taken by W. Emery Stark, Esq. *Presented by W. Emery Stark, Esq.*

A set of quarter-plate platinotypes, illustrating scenes of life in Samoa and Fiji at the present time. They were taken upon the occasion of Mr. W. Emery Stark's visit to the islands in May and June, 1903.

(1 and 2) Suva; (3) A street in Suva; (4) The "town clock," a log of wood struck with a mallet, Suva; (5–7) Levuka; (8) Rewa; (9) The chief of Rewa in front of the royal hut; (10) Coming out of church, Rewa; (11) The chief of Rewa; (12 and 13) Bread-fruit trees on the Rewa property; (14) The family and councillors of the chief of Rewa; (15) An old cannibal, a relic of the past; (16–18) Apia; (19) A scene in Apia; (20 and 21) The beach, Apia; (22 and 23) Scene near Apia; (24) The Court of Justice, Apia; (25) A double war-canoe, Apia; (26) Native policemen, Apia; (27) The chief justice (native) of Samoa; (28) A mission school, Apia; (29) Coming out of church on Sunday, Apia; (30) Natives in their Sunday best, Apia; (31) Cocoa-nut palms, Apia; (32) An avenue of palms, Samoa: (33) A chieftess; (34) A chieftess and baby; (35) Making baskets of palm-leaves; (36 and 37)

Hut building; (38) A native hut; (39) A government hut for visitors up in the mountains near the crater lake; (40) Making "kava," a native drink; (41-43) The crater lake; (44) Our boys bathing in the crater lake; (45) Natives of Samoa; (46) A family group; (47) Clearing the forest; (48-52) Views in the Samoa islands; (53) Native soldiers and police, Pago-Pago; (54 and 55) Pago-Pago.

New Zealand. **Stark.**

Six photographs of the Great Waimangu geyser, taken by W. Emery Stark, Esq. *Presented by W. Emery Stark, Esq.*

A most interesting set of six photographs of the Great Waimungu geyser (North island, New Zealand), which broke out for the first time in January, 1901. It is in eruption about every thirty-six hours, and these photographs show six different stages of the eruption, on April 17, 1903, from its early indications to the final stage.

New Zealand. **Stark.**

Eight photographs of the New Zealand Alps, taken by W. Emery Stark, Esq. *Presented by W. Emery Stark, Esq.*

These photographs vary in merit, but some of them are remarkably good. They are enlargements, measuring 7½ inches by 9½ inches. One or two of the Tasman glacier are especially interesting.

(1) Mount Cook; (2) Mount Cook from the "Governor's Bush;" (3) The Tasman glacier with the Dome; (4) The Tasman glacier with Mount de la Beche; (5) The Tasman glacier with Mount Tasman; (6) The moraine, Tasman glacier; (7) Mount Sefton; (8) Mr. Stark's glacial work on the Tasman glacier.

Northern Nigeria. **Burdon.**

Twenty-one photographs of Northern Nigeria, taken by Major J. A. Burdon, C.M.G. *Presented by Major J. A. Burdon, C.M.G.*

Major Burdon was appointed British Resident of Sokoto soon after the country came under British rule, and, during his official visits to native chiefs and others, has had exceptional opportunities of photographing some of the leading persons and interesting scenes at an important historic period. Several of the photographs illustrate Major Burdon's paper in the last number of the *Geographical Journal*. The following are the abbreviated titles, but a very complete description has been written upon each photograph:—

(1) The Sarikin Muslimin and Waziri of Sokoto; (2) Mohammadu Maiturare, Marafa of Sokoto; (3) Malam 'Akal; (4) The Sarikin Yamma, headman of Dogon Daji; (5) Mainasara, a native of the upper Benue; (6) Kiari, a native of Western Bornu; (7) The Emir of Argungu, the heir to the Gando Emirate; (8) Kiari, senior native political agent, Northern Nigeria; (9) Police barracks, Sokoto; (10) The plain outside Sokoto; (11) Government House, Zungeru; (12) View from the verandah of Government House, Zungeru; (13) The Sarikin Tambawel; (14) Natives of Sokoto; (15) A street in Sokoto; (16) Sokoto horsemen; (17) The tomb of Othman dan Todio at Sokoto; (18) Native compound, Sokoto; (19) Native horsemen at Sainyinna; (20) Jarumai, messenger of the Emir of Argungu; (21) Group of native horsemen.

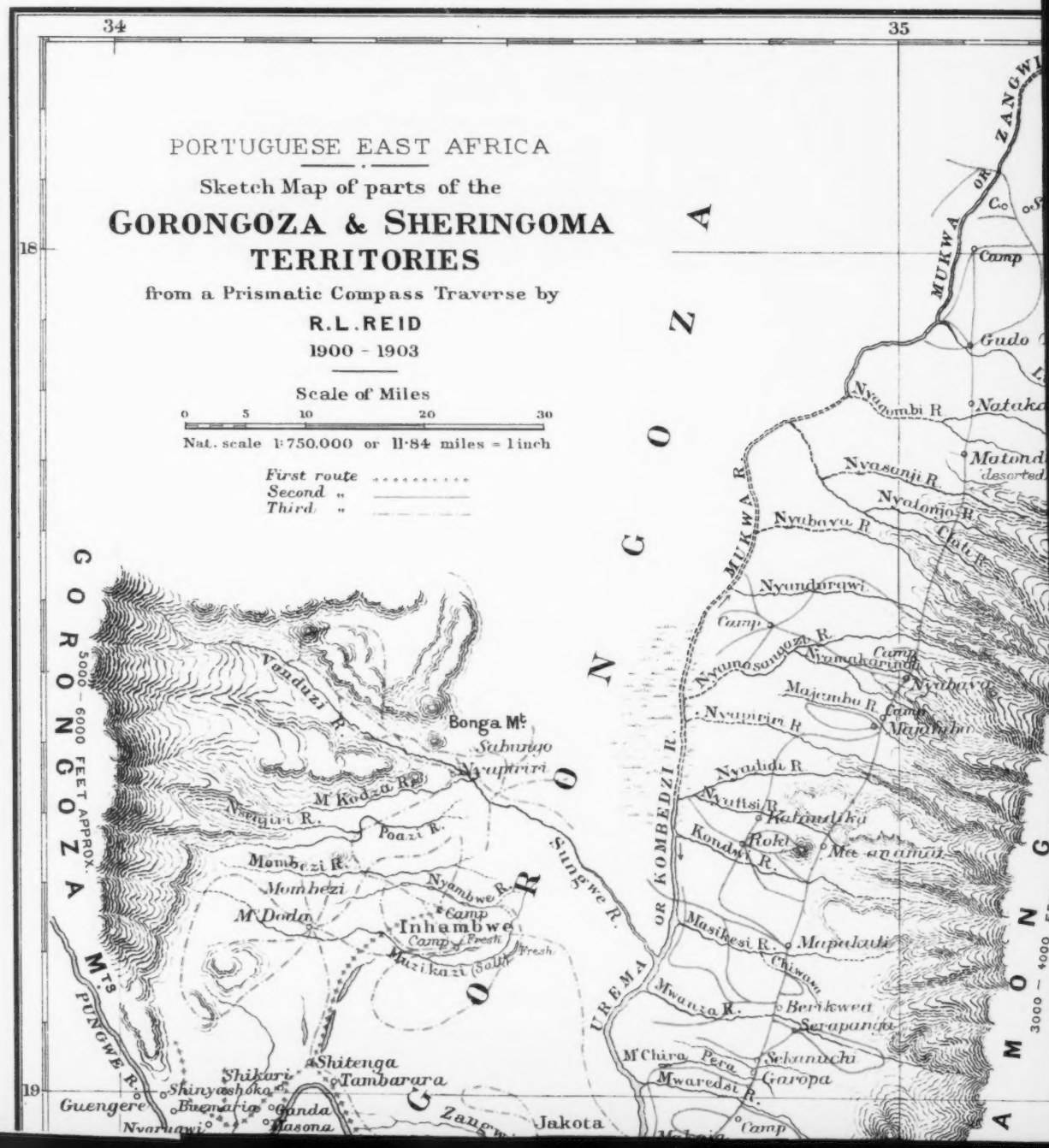
Siam. **Adam.**

Nineteen photographs taken in the Province of Monthon, West Siam, by Frank Adam, Esq. *Presented by Frank Adam, Esq.*

Mr. Frank Adams is a resident at Puket, Island of Tongkah, West Siam, and has exceptional opportunities of visiting some of the little-known localities of that part of the country. During his visits he has taken these photographs, of which he has been good enough to send us copies. The titles are as follows:—

(1) View of Tongkah hill; (2 and 5) Tongkah bay; (3) Siamese house at the foot of Tongkah hill; (4) Watt, Puket; (6) Puket; (7) Tongkah harbour; (8) Straits of Salang, looking south-east; (9) Straits of Salang, looking north-west; (10 to 13) Islands in the Straits of Salang; (14 and 15) Mouth of the Pangna river; (16 and 17) The Takopah river; (18) Mouth of the Renong river; (19) View of the town and mountains of Renong.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.


PORTUGUESE EAST AFRICA
Sketch Map of parts of the
GORONGOZA & SHERINGOMA
TERRITORIES
from a Prismatic Compass Traverse by
R.L.REID
1900 - 1903
Scale of Miles
0 5 10 20 30
Nat. scale 1:750,000 or 11·84 miles = 1 inch
First route
Second "
Third "
34
35
18
19
GORONGOZA
MONGO
MUKWA OR ZANGWI
MUKWA R.
KOMBEDZI R.
UREMA OR KOMBEDZI R.
Sungwe R.
Vanduzi R.
Bonga Mt.
Sabungo
Nyapiri
M'Kodza R.
Nsengiri R.
Poazi R.
Mombezi R.
Mombezi
Nyambwe R.
M'Dodo
Camp
Inhambwe
Camp / Fresh
Muzikazi (Salt)
Fresh
Mt. 9
PUNGWE R.
5000 - 6000 FEET APPROX.
3000 - 4000 FEET
Shikari
Shitenga
Tambarara
Shinyashoka
Guengere
Bugnaria
Ganda
Masona
Nyamawi
Zangwe
Jakota
Camp
Gudo
Nyambi R
Nyasonji R
Nyalonjo R
Nyubava R
Nyunduzwi
Nyunasongezi R.
Nyamakarimbi
Nyubava
Majemba R
Majemba
Nyapiri R
Nyalida R
Nyutsi R
Kalandika
Rokel
Kondwe R.
Mee-anama
Masikesi R.
Mapakadi
Chiwasa
Mwanza R.
Berekwesi
Serapanga
M'Chira Pera
Sekamachi
Mwaredsi R.
Garopa
Camp

GORONGOZA.

REID.

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